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VIEWS, NEWS AND INTERVIEWS.

"The recent electrical show in New York city did considerable good for a suburban town not far from the metropolis," remarked an observant electrical man. "The city fathers of this town were in the throes of a debate as to the form of street lighting to be adopted. It looked as if gas would finally be used when a member of the board of aldermen, who had visited the electrical show, arose and spoke somewhat as follows: 'The point has been raised that we can not adopt electric lights on account of their expense and that we must, therefore, have gas light on account of its low cost. If this conclusion be true, why not go back to tallow dips, which are much less expensive than gas? I think that if my respected colleagues would visit the electrical show now being held in New York city they would quickly decide as to the form of street lighting to be used. I would be glad to have you go with me to New York as my guests and inspect what is now on exhibition at the electrical show.' The result of the matter was that the city fathers visited the show and the town is now being provided with electric street lights."

Mr. B. Franklin Lieber has received a medal and diploma, awarded to him at the World's Fair for his telegraphic cipher, for "ingenuity, admirable arrangement, economy in time and secrecy in use."

The great Chicago packing house of Swift & Company covers 41 acres of ground and employs 5,323 men. The steam plant consists of 81 boilers of 10,000 horse-power and 23 engines. The electric lighting is accomplished by 8,500 incandescents and 125 arcs.

It is reported that an electric railway is to be built up the volcano of Popocatapetl in Mexico, which is 17,000 feet above sea level, and thence down into the crater, where there are important sulphur mines. The line has been devised for the purpose of conveying the sulphur to the near-by shipping markets.

"Don't the bicycle craze cut any figure with the street-car traffic?" was asked of a conductor on one of the principal Market street lines, Newark, N. J. The answer was emphatically in the affirmative. Receipts this Summer average fully $5 less per car daily with him than a year ago. It's a good day now when he collects $28 and the average is below $25. He says he knows that the bicycle craze is responsible for a large part of the decrease, as he sees scores of people now riding wheels who used to patronize the trolley cars.

It is reported that a large number of the smaller towns in Switzerland are being supplied with electric lights, current for which is generated by water power.

Westinghouse Apparatus for Manhattan Elevated?

Some time this week officials of the Manhattan Railway Company, of New York, will visit East Pittsburgh to witness a test of the Westinghouse-Baldwin electric locomotive. The test will be made on a two-and-one-half-mile stretch of track on the Pennsylvania Railroad.

A Large Shipment of Westinghouse Apparatus.

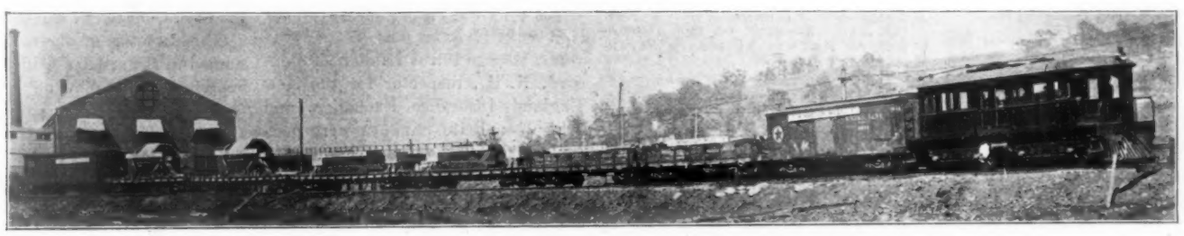
One of the largest single shipments of electrical apparatus was shipped last week by the Westinghouse Electric and Manufacturing Company to Great Falls, Mont. The shipment filled eight freight cars, and the freight of that cargo to its destination amounts to $8,000.

The machinery will be used by the Boston & Montana Consolidated Copper and Silver Mining Company in the refining of copper and silver, and it is the largest machinery of its kind ever constructed for electrical refining purposes. The Boston & Montana company is one of the largest copper mining concerns in the northwest.

Until a few years ago, the copper produced in that country was not refined, but the copper matte was sent East, some of it to England, and then refined. Since the introduction of electricity into the refining process, the companies are in a position to compete with the East.

The Anaconda Mining Company purchased from the Westinghouse company some time ago seven 360-horse-power generators, of an output of 3,600 amperes each at 75 volts. Since these machines have been in operation, the electrical process of refining has proved a great success. The machinery of the Boston company will be driven by turbines from the waters of Great Falls.

The generators will be directly connected with the turbines. There are two of them, the largest ever made, each one of 1,100 horse-power, at an output of 4,500 amperes and 180 volts. These machines are shipped in four freight cars, while the others are filled with the detail apparatus, such as switchboard appliances, etc.



A Train Load of Westinghouse Apparatus Headed by the Westinghouse-Baldwin Electric Locomotive.

RAILWAY TELEGRAPH SUPERINTENDENTS MEET.

FIFTEENTH ANNUAL CONVENTION HELD AT FORTRESS MONROE, VA. THE PAPERS READ—THE ATTENDANCE—THE TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION INDORSED.

The Association of Railway Telegraph Superintendents assembled at the Hygeia Hotel, Fortress Monroe, Va., for its fifteenth annual convention on the 17th inst., and continued in session for four days. The following-named members and others were present:

M. B. Leonard, C. & O., Richmond, Va.; U. J. Fry, C., M. & St. P., Milwaukee, Wis.; C. A. Darlton, R. & D. R. R., Washington, D. C.; G. C. Kinsman, Wabash, Decatur, Ill.; Geo. L. Lang, N. Y. & N. E., Boston, Mass.; A. R. Swift, C., R. I. & P., Chicago, Ill.; C. Selden, Baltimore & Ohio, Baltimore, Md.; W. W. Ryder, Chi., Burl. & Quincy, Chicago, Ill.; H. C. Hope, C., St. P., M. & O., St. Paul, Minn.; Horace Johnson, B. & O. S. W., Chillicothe, Ohio; H. C. Sprague, K. C., Ft. S. & M., Kansas City, Mo.; G. M. Dugan, Illinois Central, Chicago, Ill.; M. Magiff, Central Vermont, St. Albans, Vt.; P. W. Drew, Wis. Central, Milwaukee, Wis.; E. A. Smith, Fitchburg, Boston, Mass.; L. B. Foley, D., L. & W., New York; I. T. Dyer, K. C., St. J. & C. B., St. Joseph, Mo.; W. C. Walstrum, N. & W., Roanoke, Va.; F. S. Spafard, B, C. R. & N., Cedar Rapids, Iowa; N. McKinnon, T., St. L. & K. C., Toledo, Ohio; W. F. Packard, C., H.

& D. R. R.; W. H. Lovekin, Tol. & Ohio Centl., Toledo; M. A. Baker, Hannibal, Mo.; W. S. Logan, Edison's assistant, Menlo Park; A. L. Clark, Chicago; H. M. Bartlett, St. Joseph, Md.; H. A. Tuttle, Minneapolis; W. P. Ward, Cedar Rapids; E. Kettle, Grand Trunk Railway, Detroit; J. F. Ivey, Ill. Centl., Jackson, Tenn.; J. W. Forsinger, Ill. Centl., Chicago; W. F. Williams, Portsmouth, Va.; F. Ozanne, Memphis; Geo. C. Maynard, the ELECTRICAL REVIEW; J. B. Taltavall, the *Telegraphic Age*; Thomas E. Fleming, New York; Jesse H. Bunnell, New York; J. H. Louy, C., H. & D., Lima, Ohio.

Many of the gentlemen were accompanied by their wives and daughters, and these ladies added much to the pleasure of the social features of the convention.

The first and second days were devoted entirely to business, and under the admirable direction of President Leonard a great deal of work was done. At the opening session the president made an address of welcome, which was supplemented by Mr. W. F. Williams, of Portsmouth. Letters strongly commending the purposes of the association and expressing regret on account of unavoidable absence were received from Vice-president J. W. Fortune, J. B. Stewart, Geo. T. Williams, Thomas A. Edison and Superintendents James Merrihew and I. N. Miller, of the Western Union Telegraph Company. Mr. Thomas E. Fleming, secretary of the Telegraphers' Mutual Benefit Association, appeared before the meeting and made a brief and clear statement of the objects and usefulness of the organization, whereupon the following resolution was adopted:

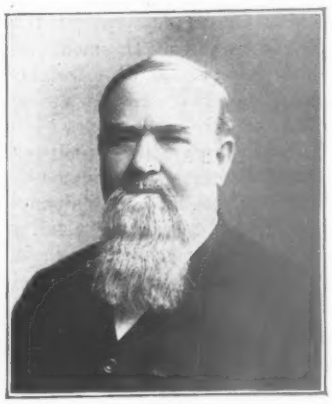
Resolved, That the Association of Railway Telegraph Superintendents in convention assembled, heartily indorse the work of the Telegraphers' Mutual Benefit Association, and wish it the largest amount of success in its object to provide for the caretaking of the widows and orphans of deceased telegraphers.

After a good deal of discussion concerning the place for holding the next regular meeting of the association, in which Chicago, Detroit, Saratoga and Niagara Falls each had strong advocates, the latter place was finally selected and June 17, 1897, fixed as the date of the meeting.

The formal papers presented and read were as follows: "Reduction of Relay Resistances," by U. J. Fry. "Electric Light and Power Plant at Superior, Wisconsin," by H. C. Hope. "Highway-Crossing Alarms," by Geo. L. Lang. "The Use of Electricity in Lighting Signals and Controlling Switches," by G. C. Kinsman. "The Telephone in Railroad Practice," by W. W. Ryder. "Educating Operators in Handling Switchboards," by W. F. Packard. "Line Construction and Reconstruction," by H. C. Hope, of St. Paul.

The officers elected were as follows: President, Geo. M. Dugan, superintendent Illinois Central Railroad, Chicago; vice-president, J. W. Lattig, Lehigh Valley Railroad, South Bethlehem, Pa.; secretary and treasurer, P. W. Drew, Wisconsin Central Railroad, Milwaukee, Wis.

The principal business of the Convention was concluded on the evening of the second day, and the two following days were spent by the delegates and their families in the enjoyment of entertainments provided by the committee of arrangements, which consisted of Charles Selden, C. A. Darlton, W. C. Walstrum and M. B. Leonard. Excursions to Cape Henry, Hampton, Newport News, the Portsmouth Navy Yard, and concerts by the government military bands were included in the programme. On Friday afternoon, a special train, furnished by the Chesapeake & Ohio Railroad, conveyed the party to Richmond, where a day was spent in visiting the many interesting historical places in that vicinity. Before the final adjournment the association adopted resolutions of thanks to President Leonard and his committee; to Mr. George W. Stevens, general manager of the Chesapeake & Ohio Railroad; to the commandant of the Fort and to Mr. F. N. Pike, the proprietor of the Hygeia Hotel, for



MR. GEORGE M. DUGAN, OF CHICAGO, THE NEW PRESIDENT OF THE ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.

their hospitality and courtesy, and their constant efforts to promote the interests of the occasion. Very complimentary and pleasant addresses were made by Mr. Swift, of Chicago; Mr. Lang, of Boston; Mr. Tuttle, of Minneapolis, and President-elect Dugan, to which graceful responses were made by Messrs. Leonard and Selden. It was a matter of general remark that no more successful meeting of the association was ever held, and that no more suitable place for such a meeting could be found. The Hygeia Hotel is admirably adapted for such conventions. An excellent convention room, provided with every facility, delightful accommodations for delegates and their families, the famous fortress within a minute's walk, salt-water bathing under the chamber windows, and the bay full of fish waiting to bite, afforded opportunities for good work and recreative recesses without the scattering of forces which so often embarrasses such meetings. General Manager Stevens, of the Chesapeake & Ohio, seemed to have given *carte blanche* for every good thing his company could command, and Mr. Leonard, as his representative, proved a most delightful host.

George M. Dugan.

Mr. George M. Dugan, who was last week elected to the presidency of the Association of Railway Telegraph Superintendents, is superintendent of telegraphs for the Illinois Central Railroad Company, with headquarters at Chicago. He is an Ohioan by birth, having been born in Brown County on Christmas day, 1835. He learned telegraphy in 1850 at Ripley, Ohio. After a year in the telegraph business he spent two years in the steamboat service. In 1853 he joined the staff of the Memphis & Nashville Telegraph Company, and was assigned to the office at Sommerville, Tenn. In 1855 he was transferred to Memphis and in 1857 he went to Grand Junction, Tenn., to open an office for the Memphis & Charleston Railroad.

During the war Mr. Dugan was taken prisoner at Bolivar, Tenn., and confined in the military prison at Alton, Ill. He was paroled, and in 1863 went South again to become assistant superintendent of telegraphs for the Mississippi Central Railroad, north of Jackson, Miss. After the war he was made agent and operator at Bolivar, Tenn., where he remained until 1876, when he was appointed superintendent of telegraphs of what is now the Illinois Central Railroad, with headquarters at Jackson, Tenn. He now holds the position of superintendent of telegraphs for the whole system of the Illinois Central, with headquarters at Chicago.

PERSONAL.

Mr. Mark A. Hanna, of Cleveland, Ohio whose success as a politician is a topic of the hour, is president of the Cleveland City Railway Company. He is also largely interested in the iron industry.

Mr. George Burns Lauder, of Concord, N. H., inspector for the New England Insurance Exchange, and Miss Eva Belle Sanborn were married at Concord on June 17. The ELECTRICAL REVIEW extends its congratulations.

Garret A. Hobart, the Republican nominee for vice-president, is a man of large commercial and industrial interests. Among other offices he holds is that of president of the Paterson, N. J., Railroad Company, a consolidation of trolley lines.

Another Electric Elevated Road Opened.

The Lake Street Elevated Railway in Chicago, the second to be operated exclusively by electricity, was opened for traffic on June 14 at daylight, the experimental runs from the previous midnight having proved entirely successful.

The road is one of the Yerkes lines and runs West from the vicinity of the Masonic Temple for a distance of six and one-half miles double track. The third-rail system is used.

Death of M. J. Sullivan.

Michael J. Sullivan, formerly well known in electrical newspaper circles, died at Washington, D. C., on June 12, of appendicitis.

THE NEW YORK TELEPHONE COMPANY.

A NEW ORGANIZATION WITH SIXTEEN MILLION DOLLARS CAPITAL.

At Albany, N. Y., on June 19, the New York Telephone Company was incorporated with a capital of $16,000,000. Its objects are to construct, buy or lease lines of electric telegraph and telephone to be operated in New York city, and thence to Albany and Boston and the intermediate cities, towns and places in New York, Massachusetts, Rhode Island and Connecticut; also across or under the North and East rivers and New York harbor to Jersey City, Long Island City, Brooklyn and Port Richmond, S. I.; also through New Jersey to Philadelphia, and to the intermediate cities and towns; also from Long Island City and Brooklyn to Montauk Point, L. I., and to the intermediate cities and towns; also from Port Richmond, S. I., to all places in Staten Island, and also to other cities, towns and places in the States mentioned, and to connect with other lines leading to places outside of the territory.

The incorporators are Charles F. Cutler, of Morristown, N. J.; John H. Cahill, Joseph P. Davis, Thomas T. Eckert, William T. Bouchelle, James Merrihew and William H. Wolverton, of New York city; William H. Forbes, John E. Hudson, of Boston; George J. Gould, of Lakewood, N. J.; Col. John Jameson and Charles A. Tinker, of Brooklyn, and John Van Horne, of Bayonne, N. J.

There are 160,000 shares of stock and each incorporator subscribes for 10 shares. The company paid an incorporation tax of $20,000.

The directors of the new company named in the articles of incorporation represent the following companies: Western Union Telegraph Company, George J. Gould, Thomas T. Eckert, Charles A. Tinker, James Merrihew and John Van Horne; American Bell Telephone Company, John E. Hudson and W. H. Forbes; Metropolitan Telephone and Telegraph Company, New York City, Charles F. Cutler, John H. Cahill, Joseph P. Davis, William T. Bouchelle, William H. Wolverton and Col. John Jameson.

The territory of the Metropolitan company includes New York city and its suburbs, between the Hudson and East rivers and Long Island Sound.

The Metropolitan T. & T. Company has a capital stock of $3,500,000, and a bonded indebtedness of $1,961,000. The Westchester Telephone Company covers the county of that name, and its capital is $300,000.

Lord Kelvin's Cablegram.

In answer to its congratulatory cablegram to Lord Kelvin, the ELECTRICAL REVIEW received the following reply:

Glasgow University, June 15, 1896.
To my friends at New York:

Thank you warmly for your kind sympathy with me on the occasion of the jubilee. I wish I were near enough to shake you every one by the hand, and to tell you how much gratified I am that you think of me as a friend and comrade.

KELVIN.

The Electric Grass Killer.

In response to a letter from the *Railroad Gazette*, Mr. J. F. Wallace, chief engineer of the Illinois Central Railroad Company, describes an electric grass killer as follows:

The electric weed killer referred to is evidently the machine with which some experiments were made on the Yazoo & Mississippi Valley Railroad under my direction some time since. The inventor is Capt. A. A. Sharp, of Memphis, Tenn., superintendent of the New Orleans Division of the Yazoo & Mississippi Valley Railroad. This apparatus has only been used in a small way experimentally. It consists roughly of a wire brush about 10 feet long and four inches wide, suspended by a frame from the end of a flat car, on which was placed a dynamo, the necessary transformers and other electrical equipment. The entire apparatus was handled by a locomotive, from which steam was furnished to operate the dynamo.

The *modus operandi* consisted of charging the brush with electricity and moving it slowly along in contact with the vegetation, the theory being that the current would leave the brush, enter the plants, and, by breaking down their cellular tissue, destroy their vitality. The principal difficulty encountered, devoid of technicalities, was in supplying the necessary quantity and strength of electrical energy to perform its functions. In the experiments that were made, the immersion of the brush in the thick Bermuda grass that covered the track where the test was held exhausted the electrical force within the distance of a few feet, moving at a speed of three or four miles an hour, without any appreciable effect on the grass at the moment of application; but on the following day the grass to which the brush had first been applied, when the current was at its full intensity, was found to be dried up and quite dead. Where the brush was suspended so as to barely touch the edges of weed growth, or where the current could be concentrated upon isolated pieces of vegetation, the plants receiving the charge were entirely destroyed and burned. Also milk weed and other vegetable matter in which there was a large percentage of moisture would, when brought in contact with the brush, absorb the current and be killed, while the drier grass, which came in contact with the brush at the same time, would not be injured.

I received your letter while out on the road and have no data at hand showing the amount and intensity of the electric current used, or the amount of horse-power and other scientific information which would be of interest only to technical engineers or others desiring to thoroughly investigate the subject. I was personally present, however, when the experiments were made, and was compelled to draw my own conclusions as to the value of the machine, which were, that it would require an expenditure of $20,000 or $25,000 to construct a perfect and efficient apparatus on this principle, and that it would require at least a 500-horse-power dynamo and electric apparatus, with the necessary steam power for same, to secure economical and satisfactory results. It also seems to me it would be necessary to subdivide the brush into small sections insulated from each other, so that the electric energy would not be concentrated on a single weed or clump of vegetation, which might be a superior conductor. The brush would also have to be of such flexibility and so easy of control that it would readily conform to the cross-sections of the roadbed and be readily manipulated.

Even a large machine of the character indicated, with all the necessary improvements, would be able to only partially destroy vegetation for a width of approximately 10 to 12 feet; and then there would probably remain more or less vegetation which would not be affected and would have to be removed by ordinary track methods. I have no doubt, however, that if the idea was taken up by an educated mechanical engineer, assisted by an electrician, and the requisite funds supplied, a machine could eventually be devised that would be practical. More extended experiments would, of course, have to be made in order to determine the amount of amperes, voltage, etc., required to give the most economical and efficient results; and it will be necessary for the machine to completely kill vegetation inside of the rails and for a space of three to four feet on each side, and be able to do so continuously at a rate of five or six miles per hour, in order to do satisfactory work.

The advantage of this method of destroying vegetation is in the destruction being absolute. The partial destruction accomplished during the above-mentioned experiments would not be satisfactory. After the tests we made, I pulled up several large weeds which were one-sixteenth to one-eighth inch in diameter, and were so hot at the surface of the ground that they could scarcely be held, and the heat was felt at the extremities of the roots, while other pieces which did not appear to be affected when the brush was applied were dead the next morning.

These experiments were made during 1894, and were discontinued on account of the uncertainty of being able to arrive at any practical results at a moderate expense.

I have answered your letter at length because of the large number of inquiries I have received from various persons in relation to this apparatus, and I would refer to the inventor, Captain Sharp, for further information. Mr. Sharp may have made further experiments, of which I have not been advised, and I have no doubt he will be glad to answer all inquiries.

Early Experiments in Vacuum-Tube Lighting.

Mr. B. E. Greene, of Brooklyn, N. Y., recently came into possession of an old book on electricity, which gives, among other things, an interesting account of some early experiments in vacuum-tube lighting. The title page of the book reads as follows:

An
Essay on Electricity.
Explaining
The Theory and Practice of that Useful Science
and the mode of applying it
To Medical Purposes.
With an Essay on Magnetism.
Corrected and Considerably Enlarged.
By George Adams,
Mathematical Instrument Maker to His Majesty.
London.

Printed by R. Hindmarsh, for the author, and
sold by him at Tycho Brahe's Head,
No. 60 Fleet st.
1787.

On page 287 is found the following:

CHAPTER XIV. — OF THE ELECTRIC LIGHT IN VACUO. EXPERIMENT CC.

Take a tall, dry receiver and insert in the top, with cement, a wire with a rounded end, then exhaust the receiver, and present the knob of the wire to the conductor, and every spark will pass through the vacuum in a broad stream of light, visible the whole length of the receiver, moving with regularity unless it is solicited and bent out of its way by some non-electric, then dividing itself into a variety of beautiful rivulets, which are continually dividing and uniting in a most pleasant manner.

If the vessel is grasped by the hand, at every spark a pulsation is felt, like that of an artery, and the fire bends itself towards the hand. This pulsation is even felt at some distance from the receiver, and in the dark a light is seen between the hands and the glass. The streams of light pass silently through the receiver because the air is removed, by whose vibration sound is produced.

From some experiments made several years since by Mr. Wilson with an excellent air pump of Mr. Lineaton, he observed that very small differences of air occasioned very material differences in the luminous effects produced by the electric fluid, for, when all the air was taken out of the receiver which this pump at that time was capable of extracting, no electric light was visible in the dark.

Upon letting in a little air by a stop-cock a faint electric light was visible, and by letting in a little more air increased the light, which again decreased on letting in more air, till at last on admitting large quantities it entirely vanished. By this experiment it appeared that a certain limited quantity of air was necessary to occasion the greatest luminous effect.

The following interesting account of "experiment CCIX" is given:

Present a thin exhausted flask * * * to the conductor, and the bottle will be luminous from end to end, and when taken from the conductor will continue luminous, moving in various curvilinear directions for a considerable time, flashing at intervals in a manner which very much resembles the aurora borealis. The light may be revived by passing the flask through the hand. The stroke of the fluid against the glass is very sensibly heard and felt in this experiment.

The flexuous motions of electric fluid in an exhausted receiver may in some degree be produced at pleasure. By wetting the outside of the receiver the fire will follow the direction of the wetted line, as the resistance is now lessened on one side, and the fire can adhere and accumulate itself on the inside of the receiver, because by means of the dampness it can expel a portion from the outside.

This experiment may be exhibited very pleasingly by making a Torricellian vacuum in a glass tube about three feet long then sealed hermetically. Hold one end of this tube in the hand and apply the other to the conductor, and immediately the whole tube will be illuminated from end to end and will continue so for a considerable time after it is removed from the conductor, flashing at intervals for many hours.

The relation of the degree of rarefaction to the quality of light is defined by the author as follows:

Air rarefied 40 times, light in large, long, but divided streams.

Air rarefied 70 times, fine diffused light of a white color.

Air rarefied 80 to 400 times, beautiful diffused light, inclining to red or purple, and filling the whole receiver.

When the gauge showed the utmost degree of exhaustion, a different light filled equally the receiver; it had hardly any reddish hue.

A Southern Supply Company Changes Hands.

The General Electric Company has purchased the stock of the Southern Electrical Manufacturing and Supply Company, of New Orleans, La., and has succeeded to its business.

Telephone Line Construction in the Rocky Mountains.

Telephone construction in the Rocky Mountains is anything but child's play, and is attended with a great deal of hardship, says an exchange. The line built from Leadville to Aspen several years ago is a case in point. It took two months to cover the entire length, 48 miles. In ordinary construction the poles would be set 42 to the mile, but at certain points, where sharp turns were necessary, the number would sometimes be increased to 75 to the mile. The members of the construction gang had to be as expert as axemen as they were as linemen, for when timber was encountered a path of 200 feet on each side of the line had to be cleared in order that wires might not be broken when trees were blown over by the terrific blasts which at times prevail in that region.

A great deal of the comparative slowness of the installation was owing to the inability of the workmen to labor in such a rarefied atmosphere. At one point the wires were strung at an elevation of 12,000 feet above the sea level. In such an altitude the lineman soon becomes completely tired; after he has climbed two or three poles he has to take a rest to recuperate his energies. The preparation of the holes for poles, which would have been tedious in similar ground even in an ordinary atmosphere, was an especially slow and fatiguing operation. It was often necessary to blast a hole for the pole by the use of giant powder, and an ex-miner, who had had an extensive experience with explosives, was assigned to the job.

The digging of one pole hole would sometimes occupy him for a whole day, working honestly. Over 300 pounds of powder were used on the line for this purpose. When the continental divide was reached the poles had to be abandoned and the wires were placed in a submarine cable, which was buried in a two-foot trench for a distance of 7,600 feet. The advisability of abandoning aerial construction at this point was demonstrated by the experience of the company that maintains the Denver & Leadville line. At one point on that line, Mosquito Pass, the poles were originally set 70 feet apart. As soon as the wires were covered with sleet they promptly snapped, and the line was useless. Double the number of poles were then used, with the same result. The space between the poles was then reduced to 25 feet, but as soon as the sleet came the line was swept down flat. Eventually an underground cable was laid for two and a half miles, and there has been no trouble since.

New Haven's contract with the New Haven Electric Company was signed last week by Mayor A. C. Hendrick and Alderman B. L. Lambert, chairman of the committee on lamps. The contract is for furnishing the city with electric lights for a term of three years, from July 1, at the rate of 27 cents a night or $97.50 a year. James English will sign the contract for the electric company as president.

The Use of Accumulators with the Alternate-Current Supply at Zurich.

The night load at the central station lighting this city being near the maximum output of the station, and the street mains, moreover, not being adequate for dealing with much heavier currents than those employed at the time, it was decided, when current was required for a large new music hall, to light the same by means of direct currents from accumulators, says the *Electrotechnische Zeitschrift*. These accumulators are charged during the day by means of rectified alternate currents, so that, in addition to relieving the night load, the day load is increased, and thus much more favorable conditions obtained for the economical working of the station. The consumption of current at this music hall (the "Neue Tonhalle") is equivalent to two thousand 16-candle-power lamps.

The plant is installed in the cellars of the Neue Tonhalle, and comprises a battery of accumulators, two current rectifiers, the switches, and measuring arrangements. Moreover, in view of the novelty of the arrangement, an alternate to continuous-current transformer was put in as a reserve.

The alternating current for the installation was taken mainly from two 30-kilowatt transformers, transforming down from 2,000 to 105 volts, and arranged at about 100 metres from the installation. From these transformers the secondary alternate current passed through double-pole switches to the rings of the rectifiers; between the rectifiers and battery and the distributing network, which is on the three-wire system, the switches and measuring instruments are inserted in the usual way.

Since the main transformers deliver the secondary current at a pressure of 105 volts, corresponding to the pressure in use, and in order to utilize as large a proportion of the available current as possible, two additional transformers, each of 15 kilowatts, were introduced; these transformers supplied their secondary current at a pressure of 55 volts, and thus gave 160 volts when in series with the main transformers.

In order to enable the number of windings of these additional transformers in circuit to be gradually increased in accordance with the increase in the back electro-motive force of the accumulators during charging, these transformers are provided with 10 terminals connected to a suitable switch. This switch is made exactly the same as an accumulator switch, so that the sections of the transformer can not be short-circuited while the switch lever is being moved from one contact to another. Each section of the transformer corresponds to an increase of pressure of about five volts. By the use of this arrangement the regulation of the rectifiers is very much facilitated during charging, since the position of the brushes scarcely needs adjustment. The double-pole switches between the transformers and the rectifiers enable the direction of the current to be reversed if necessary. The rectifiers consist of two-part commutators with collecting rings for the reception and broad bars for the delivery of the current, and a small synchronous motor which sets the commutator in motion. In the Zürich installation the motors for the rectifiers were one horse-power each, supplied with current at 65 volts from two special small one-kilowatt transformers. For starting the synchronous motors small continuous-current motors are employed, connected to the battery. When the rectifiers are set in motion water resistances are introduced into the continuous-current circuit, these resistances being ultimately short-circuited. The cut-outs for protecting the system against reversal of the current are polarized so as to provide for rapid and reliable operation, their electro-magnets, in addition to the main-current coil, having a second weaker coil which receives current from the battery through a resistance and polarizes the core in the same direction as the charging current. Should a reversal of the main current take place, the two coils oppose one another, and the automatic cut-out interrupts the current. By means of a suitable switch either rectifier can charge either half of the battery. The accumulator switch is provided with an automatic device for maintaining a constant pressure. The battery of accumulators, made by the Société Suisse pour la Construction d'Accumulators Electriques, Mary-le-Grand, consists of 118 cells of the Pollak type, S 44, and possesses a capacity of 2 × 105 volts, of 1,528 ampere hours, with a four-hour discharge at 382 amperes, a maximum discharge current of 472 amperes, and a maximum charging current of 336 amperes.

The current rectifiers were each constructed to deal with currents of 240 amperes at 110 to 160 volts. On each collecting ring rest four brushes; the current is taken from the rectifier by means of four rows of brushes, of which each alternate pair are connected together and are adjustable relatively to one another by means of a hand wheel. A second hand wheel permits the whole system of brushes being adjusted around the axis as usual.

Each rectifier is mounted on a simple wood base, to which is also secured a small switchboard for the reversing switch and accessories. Beneath the stand are arranged the small continuous-current motor for starting and the liquid resistance. The latter is an iron vessel, with an iron cover insulated therefrom and turning about a hinge, its rotation being effected by a hand wheel through worm gearing; when switching in, sector-shaped iron plates, secured to the cover and arranged to move between plates secured to the bottom of the vessel, dip into the liquid. These sector-shaped plates are at first only immersed at their ends, so that the resistance is gradually reduced; as soon, however, as the cover comes down on to the vessel, two contacts pieces on the vessel and cover engage with one another and short-circuit the resistance.

The method of working with the rectifiers is as follows: The synchronous motor is set in motion in the proper direction by means of its driving motor, and is then switched in, when the driving motor is stopped and the brushes applied to the rectifier. The charging lever of the section of the battery to be charged and the automatic cut-out are then switched in and the double-pole switch supplying the alternating current to the rectifier brought into its "on" position. Before the circuit can be completed (which is done first through a resistance) it is necessary to ensure that the similar poles of the rectifier and of the battery are opposite one another. For this purpose two incandescent lamps in series are put in shunt with the resistance through which the circuit will be first completed, this being done by means of a key; if they incandesce strongly when switched in, then unlike poles are connected, and the reversing switch must be brought into its other position. After this, the circuit is completed through the switching-in resistance, which is gradually reduced and finally short-circuited, after which the brushes of the rectifier are adjusted to their most sparkless positions by means of the hand wheels. As the charging progresses the electro-motive force of the rectified current is gradually increased as required by putting into circuit additional windings in the supplementary transformers.

The reserve alternate to continuous-current transformer was made by the Maschinenfabrik Oerlikon. It consists of an alternate-current motor operated by the primary current at 2,000 volts and takes 30 amperes when running at 330 revolutions per minute, and a shunt dynamo coupled directly thereto, which supplies 170 amperes, at 105 to 160 volts, at each of its two collectors.

Soldering Telephone Wires and Cables.

An aged Chicago lineman gives vent to his feelings and opinions on joint soldering as follows:

"I am too old and stiff to swarm up a pole, but I have been in this business long enough to know one thing, and that is 'take no chances.' A careless job of wiring will do more damage and harm at times than a cyclone. A bad joint means leaks, and leaks mean loss of money to the company, and the whole means rank carelessness on the part of the 'soldier' who was too lazy to do his work.

"What's a joint for? It's to connect two ends of wire so as to make one conductor, and have that conductor as good as though there was no joint there. You can't do that with poor work. There are plenty of dubs working at this job who have no more call to be linemen than a blind baby has. How many of them always clean the ends of the wires until they are so bright that they fairly shine?

"Yet the first thing to be done in making a joint is to thoroughly clean the wires. Whether the wires are simply rusted or have bits of rubber or gum insulation sticking to them or are paraffined makes no difference. The parts that are to be put together should be thoroughly brightened with a knife or some sharp edged scraper.

"I use my knife, for I do not like sand or emery paper, for, unless the wires are carefully wiped off afterward, bits of glass from the sand-paper, or emery dust from the emery cloth, are apt to stick. Both are insulators, and I have known them to play the mischief, because the resistance they caused stopped feeble currents.

"After my wires are bright I bring the polished surfaces together with enough wire to give a good strong joint and plenty of conductivity. You see, a wire joint may be strong mechanically and weak electrically.

"But a good joint is strong in both particulars. Next, I believe in solder. I think that all electrical joints and splices should be soldered, for the solder adds strength to the joint, fills up the space between the turns of the wires and keeps out moisture.

"But the soldering must be carefully and thoroughly done. No half-and-half job will do, for, unless a lineman can turn out a workmanlike job, he would better not use a blow-pipe or a soldering bolt. If the wire ends are not perfectly clean, the resin or soldering fluid will not do its work.

"To do a good job with the soldering outfit requires plenty of heat, and the soldering iron should be well tinned, else the solder will not stick to the wire. A blow-pipe, of course, is better than the soldering bolt.

"Right here comes in a little trick which most young linemen overlook. That is, the acid must be cleaned off the joint. With acid present the iron or copper of the wire and the solder make a battery, small but complete, and the action set up will eat out a joint every time.

"If the conductor is insulated wire, the joint must be insulated as well, and, further, must be as thoroughly insulated as the conductor. All good wires have an outside covering of braid or tape put on, not for electrical insulation, but for mechanical protection.

"This covering, no matter if it is soaked in tar, asphaltum or any like substance, does not make a cotton covering waterproof. It has been found that it will carry moisture, so that if but a single thread of this tape touches a naked wire it means a 'ground,' sooner or later. Under this cover is the rubber, the real insulator.

"So you see, the joint must be thoroughly covered with a rubber tape, and this wrapping must be carried back over the rubber insulator so that not a fiber of the outer covering can touch the wire. If this is properly done the joint will be waterproof and as well insulated as though there was no joint there.

"Particular care is needed in making joints in telephone wires. The ordinary joint, which you boys call the 'Western Union,' but which was made before a telegraph instrument ticked in Chicago, is not good enough for telephone work. I like the English joint better. That is the well known Britannia joint, which is made by overlapping the ends of the wires and binding them together with fine wires.

"If the American telegraph joint is used it should be covered with tinfoil and then thoroughly covered with good jointing braid. A man can not be too careful in making joints, for a poor joint means resistance, and resistance is heat, and heat brings the blaze, and the result is one of those mysterious fires which are charged to electricity."

The Bullard Transformer.

There has been during the past two years a noticeable increase in the demand for high-grade economical transformers, and the prediction that was made, that a cheap transformer was what would be called for, has not been verified. Central stations throughout the country are realizing that it is the constant loss on open secondaries, or what is usually termed the leakage current, which is constantly passing through a transformer whether the lights are on or not, that constitutes the actual economy of a converter. Comparatively speaking, there are but a few transformers on the market at present that realize in any measure the ideal of what a converter should be. But after a long series of experiments, involving great care, technical knowledge and expense, the Bullard transformer, that has just been placed upon the market, claims to offer to the central station a higher degree of economy than has yet been considered possible when combined with close regulation.

FIG. 1.—THE BULLARD TRANSFORMER.

It is pretty generally understood that a high degree of excellence in a converter is only obtainable by the use of the very best material, put together without regard to expense. The highest-priced technical knowledge has been used in the electrical determinations of the Bullard transformer, and no expense has been spared in the purchase of the softest and most desirable quality of iron that has as yet been used for this purpose. The Bullard Electric Company, 1563 Monadnock Building, Chicago, manufacturers of the Bullard transformer, have been actuated in their experiments by the belief that many plants in the country desire the most economical converter obtainable, without reference to the slight existing difference in first cost. This company claim that they will readily demonstrate, by offering their transformer for service test, that a net saving of four or five dollars per year per 1,000-watt converter, can be made by the use of the Bullard converter, even in place of the next highest grade transformer upon the market.

There have been numerous preliminary and exhaustive tests on the Bullard transformer during the last few months before it was deemed advisable to solicit orders. The most recent and exhaustive test, made by an electrical engineer, Prof. H. S. Carhart, of the University of Michigan, on a 20-light or 1,000-watt transformer, is stated to be as follows:

EFFICIENCY.

Full load	95.18 per cent.
Three-quarter load	95 11 "
One-half load	94.47 "
One-quarter load	91.66 "

REGULATION.

Full load	2.5¢ per cent.
Three quarter load	2. "
One-half load	1.27 "

Watts loss on open secondaries, 23.6.

Rise in temperature after more than one hour with full load, 21 degrees Fahrenheit.

All of the Bullard transformers are made with the greatest care, only mica insulation being employed. Before finally taping the coils, they are thoroughly saturated and boiled in a compound of the highest insulating qualities, and are then baked to a solid mass by being subjected for several days to a very high degree of temperature. The transformers are made either for 2,000 or 1,000 volts primary, as may be desired, and for two reductions on the secondary. Fig. 1 shows the transformer in its case ready for installation. Two hooks for adjusting to cross-arms are packed with each transformer, so that they may be expeditiously installed on poles. Fig. 2 shows the general arrangement of the coil, ready to be placed in the case. A desirable feature of this transformer is that the coils are not in any way bolted or screwed into the case, the arrangement being such that the bolting down of the cover holds the coil in a firm and rigid position. Fig. 3 shows the general arrangement of the fuse box open. The Bullard transformer is made with detached fuse box. The Bullard Electric Company offer an exceptionally liberal guarantee, which suggests the confidence that the manufacturers have in their product.

FIG. 2.—COIL OF BULLARD TRANSFORMER.

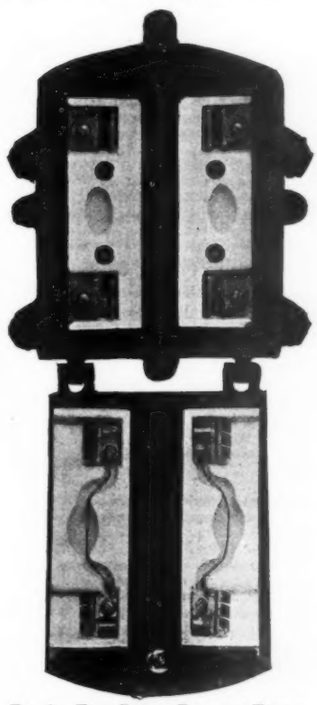


FIG. 3.—FUSE BOX OF BULLARD TRANSFORMER, OPEN.

St. Louis Connected with the East by Telephone.

The ELECTRICAL REVIEW acknowledges the receipt of an invitation from the American Telephone and Telegraph Company to be present today at the opening of the company's long-distance lines between St. Louis and the principal cities east of the Mississippi River. The ceremonies are to be held from two to five o'clock in the directors' room of the Merchants' Exchange.

ELECTRIC LIGHT FLASHES.

The Burlington, Kas., electric light plant has been transferred from E. E. Follensbee to C. S. Cross, of Emporia. The price was $2,750. Mr. Cross will assume control at once and make a number of needed changes and improvements. It is understood that an incandescent system will be put in.

The power house of the St. Louis Electric Light and Power Company, on Lucas avenue, lost three smokestacks during the tornado. Two new ones have been put up and the third will soon be in place again. The company's poles did not suffer much, and most of the damaged wire has been replaced. "We are serving all of our patrons now, except six or seven," said Mr. Scudder, secretary of the company, last week, "and by to-morrow night we'll have re-established the old connection with them. In a few days everything with us will be running as satisfactorily as if there had been no storm."

The Amherst, Mass., Gas and Electric Light Company has voted that the plant be moved and a station for its new location be erected on Spaulding street. The entire cost is to be limited to about $12,000. For the new station a 200-horse-power Corliss engine has been purchased from the Philadelphia Engineering Company, Philadelphia, and a 125-horse-power boiler has been bought of the Dillon Boiler Works, of Fitchburg. A new dynamo of 120-kilowatt capacity will probably be also purchased for the new plant. This will give Amherst an electric light plant of sufficient power to light the town for a number of years. The new station will be built first and the old one kept running until it is ready.

Messrs. Fyfe, Farrand and Henderson, of the public lighting commission, Detroit, opened a lot of bids for the furnishing of machinery, as follows, but no action was taken, as a quorum was not present:

One hundred direct-current arc lamps—Brush Electric Company, $1,900; Adams-Bagnall Electric Company, $2,250.

Fourteen thousand feet of lead-covered cable—Safety Insulated Wire and Cable Company, 17½ cents per foot; American Electrical Works, 18 cents per foot; Standard Underground Cable Company, $15\frac{48}{100}$ cents per foot.

Two two-cylinder compound non-condensing steam engines—A. L. Ide & Sons, $2,400; Westinghouse, Church, Kerr & Company, $2,187.

Two direct-current four-pole arc lighting dynamos—Western Electric Company, $4,350; Brush Electric Company, 48-kilowatt, $3,800; Brush Electric Company, 60-kilowatt, $4,800.

One hundred and eighty thousand feet of insulated copper wire for overhead lines—Holmes, Booth & Haydens, $15.53 per 1,000 feet; Henry L. Walker, $14.71 per 1,000 feet; Western Electric Company No. 1, $15.15 per 1,000 feet; Western Electric Company No. 2, $19.50 per 1,000 feet; Chicago Insulated Wire Company, $16.65 per 1,000 feet; Standard Underground Cable Company No. 1, $17.92 per 1,000 feet; Standard Underground Cable Company No. 2, $16.08 per 1,000 feet.

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SPECIAL NOTICE TO ADVERTISERS.

***CHANGES** for advertisements must be in this office by Friday noon for the following week's issue.*

***NEW ADVERTISEMENTS** should be in the office not later than Saturday noon to insure publication the following week.*

NEW YORK, JUNE 24, 1896.

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In the death of Harrison J. Smith the electrical fraternity loses one of its best men. He was eminently qualified by natural ability and training for the responsible position he so capably filled. He was a fine type of man and his sad death leaves vacant a place in his wide circle of friends that can not be filled.

THE NEW YORK TELEPHONE COMPANY.

The organization of the New York Telephone Company was announced last week. Our daily contemporaries, with abundant misinformation, very generally announced that a new rival of the Bell interests was in the field. This is very much a mistake. The New York Telephone Company is simply an organization to take over the interests of the Metropolitan Telephone and Telegraph Company and, with increased capital, conduct its vast business more directly and more economically. Three-fifths of the $3,500,000 capital of the Metropolitan Company is owned by the American Bell Telephone Company and two-fifths by the Western Union Telegraph Company, and the directors of the New York company will be from the directories of these two powerful organizations. The Westchester Telephone Company, a small sub-company, will be included. The New York & New Jersey Company is not included, and will continue under its present able and successful management.

The fact that will interest all telephone and telegraph people is that the organization of the New York Telephone Company is strong evidence that the American Bell Telephone Company and the Western Union Telegraph Company are working together harmoniously, and that the expiration, in November next, of the contract under which these two companies have been operating probably will not cause any rupture between them. On the contrary, it is to be expected that the clear-headed business men at the head of these two great companies will see that they continue to have pleasant business relations to their mutual advantage.

THE AUTOMATIC TELEPHONE SWITCH PATENT.

A correspondent asks whether the Roosevelt telephone switch can be used without infringing the Watson and other patents.

This matter was fully considered in the ELECTRICAL REVIEW for March 21, 1894, to which article our correspondent is directed for a complete analysis of the situation. To what was there said may be added that the Roosevelt switch patent, No. 215,837, of May 27, 1879, expired by limitation of law in May of this year. The Watson patent, No. 270,522, of January 9, 1883, is still alive, however, and has about four and one-half years yet to run. This patent controls an automatic switch which cuts out the secondary coil when the telephone is hung up. The first claim of the patent will serve to explain its scope. It is:

1. In combination with suitable contact points and springs electrically connected with the call-circuit and the primary and secondary circuits of a transmitter, the latter circuit including a hand telephone, a lever electrically connected with the main line in a telephone circuit, substantially as described, to bring in the hand telephone and transmitter and break the call-circuit, or to cut out the hand telephone and transmitter and establish the call-circuit, accordingly as the lever is moved in one direction or the other.

THE TELEGRAPH SUPERINTENDENTS' CONVENTION.

Our report of the proceedings of the meeting of the Railway Telegraph Superintendents' Association, and the papers discussed on that occasion, printed in another part of the ELECTRICAL REVIEW, deserve especial attention.

The members of this association have outgrown their titles, and instead of being simply superintendents of telegraph lines, have been placed in positions which require them to serve as all-round electrical experts and engineers. It is the almost universal practice of railroad managers to refer to them every question in which electrical matters are in any way involved, and to put in their charge all work connected therewith.

The use on railroads of arc and incandescent lights; electric power for numerous purposes; electric signals of many varieties; crossing alarms, fire alarms, time signals and watch clocks; telephones, etc., is constantly increasing and brings the superintendents in close touch with all these progressive interests. The statement was made in the convention, that the use of telephones in railroad service is fast supplanting the telegraph, even for train dispatching and long-distance communication. While this declaration may be somewhat premature, it is quite certain that a very large part of the service now being performed by telegraph will shortly be transferred to the telephone.

This situation contains a pertinent suggestion to electrical manufacturers and promoters generally that the railroads should not be lightly estimated among their profitable patrons.

In the discussion of papers before the convention frequent reference was made to embarrassments caused by existing contracts with telegraph and telephone companies, and opinions were freely expressed that decided changes and improvements would follow the termination of the famous alliance between the Western Union Telegraph and the American Bell Telephone companies. In any future adjustment of these enterprises, the railroads are sure to exercise a powerful influence.

THE FINANCIAL SIDE.

A more cheerful tone prevailed in financial circles as a direct result of the action at St. Louis regarding currency matters. There is a much better feeling which has been expressed in a general inquiry that promises to lead to considerable broadening. There is a deep-seated short interest in the market which, in the absence of any general bull manipulation, has been able to bring about fractional reactions. London has floundered hopelessly, buying one day and selling the next, and usually getting the worst of the bargain. It does not like our foreign policy, nor the probability of a tariff revision. These at the moment about offset the declaration for a gold standard. It is yet too early to gauge the influence on business of the Republican platform; nevertheless, in certain lines of dry goods there is more activity while iron and steel is looking up. If history repeats itself there is every reason to believe that confidence will grow and that by mid-Summer the industrial pulse will once more approach the normal.

Electrical stocks had a very quiet week. The development of absorbing interest was the incorporation of the New York Telephone Company with directors representing the Western Union company, the Bell, Metropolitan, and New York & New Jersey telephone companies. Wall Street's opinion of this move is in effect that, in addition to consolidating the Metropolitan and New Jersey Telephone companies (Western Union owns considerable stock in the former), it will take over the Western Union-Bell contract in such a way that the working arrangement will be perpetuated. This is of vital importance to the stock market, owing to the heretofore general belief that an extension was improbable, and that the expiration would result in a war that would cause the telephone company to go into the telegraph business.

The New York rapid transit situation is about the same as last week. The Manhattan people asked for three weeks in which to modify their proposition. It looks decidedly as if it would secure the franchises desired to extend its lines throughout the city. There has been about the same volume of talk and irresponsible report regarding the air motors now being installed for test by the Headley people on the Lenox avenue and the Rome interests on the Third avenue line. I am told that each of these concerns has given the traction companies a bond indemnifying them against loss of traffic or damage by accident. In this connection it might be well to call the attention of the police board to the fact that it is proposed, it is said, to carry a pressure approximating 2,000 pounds to the square inch on the streets of the city.

The North American company this week held its annual meeting and submitted a report for the year ending June 30. It is now practically out of debt—for the first time in its life—and has assets for about $1,500,000, and, in addition, 33,238 shares of Cincinnati Electric Light stock. Its Milwaukee Street Railway stock aggregates about 64,000 shares. The company, it is said, is going to engage more actively than heretofore in financiering corporations. It has a certain field in the electrical industry that would prove profitable.

The security market was practically without feature, except for the excellent demand for the bonds of the Edison Illuminating Company of New York. These advanced from 107⅝ to 109 for the 1st's, and from 103 to 104¼ for the Consolidated 5's. The stock sold at 95½ and 96. General Electric has been exceedingly quiet. An effort was made about mid week to put up the price, but a number of traders became cognizant of the move and took a position that caused a postponement. The net change in the week was fractional.

The Edison Illuminating Company of Chicago has authorized an issue of $6,000,000 5 per cent bonds, payable 30 years after date, subject to call at par at any time after 15 years, for extensions, improvements and the funding of various obligations.

On the Boston Exchange, Bell Telephone advanced 1½ points on limited purchases. Erie Telephone was practically unchanged at 59 and New England Telephone at 91, Westinghouse common was 29 bid, 30 asked, and the preferred 53 bid, 53½ asked. In Philadelphia, Electric Storage common declined fractionally in the week. The preferred was unchanged. Both stocks were very quiet. Pennsylvania Heat, Light and Power was featureless and unchanged.

BAIN.

New York, June 20.

College Professors and Patents.

To the Editor of Electrical Review:

Teaching has become as much a profession as medicine or the law. The preparation required for an instructor in a modern university is varied and exacting. The returns for this arduous preparation and for the exacting work of a college professor are financially very much inferior to those received by a successful practitioner in either law or medicine. But no one, I think, would question the right of a physician or a lawyer to take out a patent on some new and useful device which he might invent. The only exception would be in the case of some instrument or appliance to be used in surgery or medical practice and by members of the inventor's profession only. Professional etiquette might then dictate that the invention should be given to the profession.

If the underpaid professor is ingenious enough to invent some useful appliance or method which has value for public use, it is very difficult to see why he should not derive whatever advantage he can gain by legal protection in the form of a patent. The probabilities are that he will spend his money in securing the patent and get no return; but if he should chance to sell his invention for a comfortable sum, he certainly has the right to do so without losing professional dignity or incurring the charge of too great a desire for "filthy lucre."

HENRY S. CARHART.

Ann Arbor, Mich., June 18.

PROFESSOR AGASSIZ AS A MONEY MAKER.

To the Editor of Electrical Review:

Referring to your editorial in the ELECTRICAL REVIEW for June 17, headed "Should College Professors Take Out Patents?" I am reminded of an anecdote of a prominent man of science, whose devotion to what he considered his duty was of an unusually high order.

The man was the late Professor Agassiz. He was at one time, just in the height of his fame and reputation, approached by the manager of a lecture bureau, who made him an unusually liberal offer to deliver a series of lectures. As the offer did not appear to arouse any enthusiasm in the scientist, the manager expatiated at some length on the financial advantages of the scheme and finally increased the offer. Looking at him steadily Professor Agassiz said: "My friend, I haven't time to make money."

Yours truly,

ELECTRICUS.

Auburn, N. Y., June 19.

SOME FAMOUS NON-PATENTEES.

To the Editor of Electrical Review:

I was quite interested in your editorial on "Should College Professors Take Out Patents?" published in the ELECTRICAL REVIEW for June 17. I simply want to ask this question: Did Faraday, Henry, Herz, Helmholtz, or Roentgen ever take out a patent for any discoveries they made in the course of their scientific work? The editors of some of the daily papers may inquire "Who is Herz?" It might be well to remind such persons at the present time of the classic work of Herz, which should not be forgotten in these days of vibrations, etheric waves and rays.

I have not heard that Lord Rayleigh has patented his method of obtaining argon nor that Professor Dewar has patented his process of liquifying gases.

Very truly yours,

SARCASTICUS.

New York, June 19.

WHY NOT?

To the Editor of Electrical Review:

Why should not college professors take out patents? They work for small salaries and are not provided for by pension when their active working days are over. It seems eminently proper that a college professor should turn his knowledge to account for his own and his family's good, either by making patentable inventions or in any other way that will assure him an income when his working days are over.

Yours truly,

ENGINEER.

Baltimore, June 20.

The interesting articles by Mr. Mark A. Replogle on "Electricity and Water Power" which have been appearing in the ELECTRICAL REVIEW will be continued as soon as the author has arranged data of recently installed water-power plants, bringing the matter thoroughly up-to-date.

SIX MONTHS OF ELECTRICAL JOURNALISM.

The ELECTRICAL REVIEW has just completed its twenty-eighth volume, which contains some of the best newspaper work ever done by a technical journal. In addition to giving thoroughly reliable news of the progress of electrical work in all its branches, the ELECTRICAL REVIEW has secured in the past six months a large number of unusually valuable and exclusive articles on important subjects. It printed the first official interview with Professor Roentgen and the only interview with Professor Salvioni, of the University of Perugia, Italy, who made some very interesting and remarkable discoveries on the Roentgen ray.

The REVIEW was also the first to give an illustrated description of the new Westinghouse-Baldwin electric locomotive, and obtained the first official interview with Thomas A. Edison on his new fluorescent lamp. This interview was illustrated with a sketch of the lamp made by Mr. Edison for the REVIEW. The greatest honor that this journal has attained is that it was selected exclusively by Nikola Tesla for giving to the world the remarkable series of articles written by him, describing his wonderful progress in X-ray photography and in vacuum-tube lighting.

The electrical field is rapidly broadening and the class of people interested in its progress is as rapidly widening; the progress made from week to week is faithfully delineated for their benefit in the ELECTRICAL REVIEW.

Reduction in the Price of Copies of Patents.

After July 1, according to an order issued by Commissioner of Patents J. S. Seymour, the price for uncertified printed copies of specifications and drawings of patents will be, for single copies, or any number of unclassified copies, five cents each; for copies by sub-classes, three cents each; by classes, two cents each, and for the entire set of patents issued, in one order, one cent each.

Coupon orders good for a single copy will be obtainable from the Patent Office on and after July 1, 1896, in packages of 20, at $1 per package. These orders will also be receivable for blue-prints and in duplicate for one copy of *The Official Gazette*. They will not be sold in quantities less than packages of 20.

National Conference on Standard Electrical Rules.

The Conference on Standard Electrical Rules, which met in New York on March 18 and 19, will not hold a meeting in June as was contemplated at the first meeting, as the committee on rules have not yet completed their report, and the meeting is deferred until a later date, probably in the Autumn, of which due announcement will be made whenever a time is decided upon.

Meekin, the Lazy Inventor, Indulges in a Practical Joke.

"I'm a joker," remarked Meekin, the lazy inventor, as he wandered into the ELECTRICAL REVIEW office. After a pause, during which no one seemed to observe his presence, he helped himself to a chair where the air currents from the electric fan would play a cooling breeze upon his dome of thought and proceeded to unburden himself.

"I went to Boston the other day to have a look at this new carbon electric generator invented by Dr. Jacques. On the train I met a friend of mine from one of the interior towns in New England. He has never done very much traveling, and consequently the conversation turned upon the fine equipment of the train on which we were riding. Although it was night and a pretty warm one at that, my friend every now and then stuck his head out of the window to see where we were at. After each one of these out-door observations, he would triumphantly remark upon the terrific speed of the train. I think he was quite stuck on himself for being on that especial train. Pretty soon the topic of conversation became slightly annoying to me and I decided to secure revenge in some way. Finally my friend, whom we will call Jones, stuck his head out of the window again after pulling his hat down over his eyes, so it would not blow off. He kept his head out of the window a little longer than usual this time. I could not resist the temptation to reach up and snap my finger under the rim of his hat. Of course, the slight shock received by the hat immediately raised it from his head and it was caught in the wind and whirled into black space.

"I think Jones was mad. At any rate, I know he made some remarks about me, himself, the train, the darkness and incidentally about his hat. I remonstrated with him for his strong language and told him that we could easily recover the hat. If I recollect correctly he made some more remarks. Finally he calmed himself sufficiently to ask how it was going to be done. I told him that the resources of modern travel provided for accidents of every kind, including such a one as this, and I further explained to him that in order to prove that what I said was so, I would send my hat to find his. With that I pulled off my hat and threw it out of the window.

"Much to my surprise, Jones immediately jumped from his seat, rushed to the porter of the car and explained to him in excited and broken tones that he was not to serve me another single drop of liquor that night, that I had gone crazy and that he would take care of me. Passengers in the adjoining seats were enjoying the performance, but did not interfere. Finally I asked Jones if I might have a glass of ice water and he said he thought it would do me good to drink two. I went out to the ice cooler and also had a short conversation with the porter.

"While I was gone Jones had again worked himself up to considerable anger, and asked me in rather a fierce way what we were going to do for hats. I told him it was all right, that we would have hats at the proper time. It was not polite to wear hats in a parlor car. Jones also observed that we would look like a couple of bald-headed babies going up to the hotel in Boston without any hats. I assured him that he was excited and unnecessarily worried about a trifle.

"After a while the train pulled into Worcester, where a stop of about five minutes was made. I suggested to Jones that we step off the train and stretch our legs. We were no sooner on the platform than a wild-eyed man came leaping toward us with an armful of hats. The porter pointed us out to him, quite unnecessarily, as we were the only two passengers without headgear. After trying on several hats we found two that would fit and I dismissed the man. Jones got excited again because I did not pay for the hats. I told him that this affair was mine and if he would keep calm that would be all I would expect of him. We got on the train again and finally arrived in Boston and spent the balance of the night at the Parker House. In the morning when we went to pay our bill the clerk said to me: 'By the way, Mr. Meekin, an express package arrived for you. I'll send for it.' In a few minutes the porter brought us a package, which, being untied, disclosed our two original hats, brushed up and cleaned in first-class shape. I handed Jones his and put on mine. The Worcester hats I gave to the porter. He now wears one of them every other day. Well, is it a joke or not?"

"Did Jones think it was a joke?"

"I don't think he is certain about it yet. In fact, I haven't explained it to him. There wasn't much to explain. When I went out for the ice water, I simply tipped the porter and told him what I wanted done. When we passed the next telegraph office, he threw on to the platform of the station a cake of soap to which a was tied a telegraph message. In response to this message, one of the railroad employés met us at Worcester with the hats. He in his turn wired back to a place near where we had lost our original hats and a track walker brought them in. They were cleaned up and forwarded to us by express. I am now beginning to believe myself that the resources of modern travel are really wonderful and also that I am also gradually developing into a joker."

Receiver for Alexander, Barney & Chapin.

Judge Beach, of the Supreme Court, has appointed William N. Lane receiver in supplementary proceedings for Alexander, Barney & Chapin, dealers in electrical supplies, formerly at 20 Cortlandt street, New York city, in the suit of the New York Insulated Wire Company, which has a judgment against them for $619.56.

HIGHWAY-CROSSING ALARMS.

READ BEFORE THE ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS, FORTRESS MONROE, VA., JUNE 17, 1896, BY GEO. L. LANG, OF BOSTON.

Your topic committee has asked me to write a paper on the above subject, clothing their request in terms so complimentary and flattering that I think I must have lost my head for the moment and agreed to furnish a paper. When my head regained its normal condition I realized that I had a big contract.

While the subject is a very important one, there seems to be but little that can be said without becoming personal, in a way, by mentioning the various devices by name, and thus, perhaps, doing injury to some and affording others free advertising. It is not my purpose to do either of these, so must treat the subject as broadly as its narrow limits will permit.

In these days of "cannon-ball" trains, the public has awakened to the fact that the danger at highway grade crossings is very great. The public, through its representatives in town and city government, has called upon the railroads for protection to which it is entitled under the laws. These demands have caused the railroad companies to seek some method of guarding these crossings, other than the primitive and expensive watchman who must be furnished, if no other acceptable safeguard is provided. The great public is not always inclined to yield its right to demand a flesh and blood flagman.

I appeared recently before a town council in Rhode Island to demonstrate to its members the superiority of alarm bells over flagmen. I expatiated on the merits of an appliance that never slept, that never forgot, that never got drunk, was always on duty, prompt and efficient.

After what I hoped was an unanswerable argument, one of the members from the rural districts asked if the bell would "keep the cows off the track." It is needless to say that my argument was useless. We are now paying a flagman at that crossing to keep the cows off the track.

Some of the efforts of our inventors are scarcely less ludicrous. One genius invented an automatic gate that closed upon the approach of a train and opened after its passage. It seemed to be perfect in its action. A committee of the city fathers and prominent citizens was invited to visit the crossing where it was erected and witness its achievements. For the first time it worked to perfection; for the second, the gate dropped between a horse and the wagon, only the frailty of the gate preventing an accident, the gate being demolished by the frightened animal.

I think I am safe in saying that as yet there is no absolutely satisfactory device for automatically giving notice of the approach of trains on a single track. The inventors have been very successful in giving us protection at double-track crossings, but as yet there is much to be desired even there.

The demand for protection comes most frequently from crossings in towns and villages at or near stations where there are side tracks, making it impossible for a bell alarm to do what is desired and not do too much. This fact often gives an automatic alarm a bad reputation. Every false alarm impairs the confidence of the public in the device, and often results in the substitution of a flagman for it, because of the complications existing, rendering it impossible for an automatic device to do all that is required and not do too much.

What will fit one place will not fit another, owing to a difference in conditions. The people often expect these alarms to show more than human intelligence by announcing the appaoach of trains that will pass the crossing, and remain silent if the train enters a side track or stops short of the crossing.

We have had to abandon an automatic alarm in one place because it could not anticipate and conform to the varied and incomprehensible movements of the local freight trains doing their work about the station yards.

The men representing the various signal companies are responsible, in a measure, for the disappointment felt by the railroads and the public in such cases, by claiming so much for their particular devices that impossibilities are expected. No allowance is made for the difficulties developed through the changes and repairs of tracks, weather conditions, accumulations of ice and snow, as well as mischievous or malicious interference.

There are many devices in the market, all of them possessing merits and all of them having weak points. I have tried many of them, and have reached this conclusion:

There are devices that will protect all of the crossings some of the time, others that will protect some of the crossings all of the time, but none that will protect *all* of the crossings *all* of the time.

I have not hoped to say anything new, but to refer to the various phases of the subject in such a way as would bring out in discussion the experience of our members, many of whom have had both varied and expensive opportunities for investigation.

Sherlock Holmes at the Telephone.

[*From the San Francisco Post.*]

"Hello!"

"Hello!"

The law clerk was in communication with the typewriter in another office.

"Ah, you have red hair," he remarked.

"How in the world can you tell that?"

"A white horse has just passed. Your hair is not very red, though."

"How can you tell?"

"The horse is not very white."

"For the land's sake!"

"And you once lived in the agricultural districts."

"Ye-es, I did—once; but how did you know that?"

"By your exclamation, 'For the land's sake!'"

"You are from the country, too," she declared.

"Yes; how did you know that?"

"By the way you rang that telephone bell. You thought you were still turning a grindstone."

"Never turned a grindstone in my life."

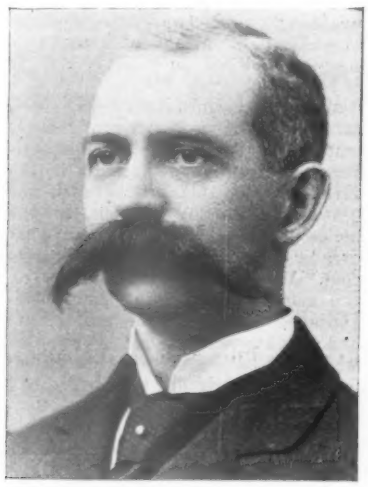
"Then it was a feed-cutter, a coffee mill, a corn-sheller or a cider press. It's all one. And you have whiskers—no, it may be the wind whistling through the telegraph wires I hear. Good-by."

The Highway Commissioners of Jamaica, Long Island, have granted a franchise to the Long Island Electric Railroad Company to lay their rails on that portion of the Jamaica and Hempstead turnpike lying within the town of Jamaica.

Harrison J. Smith.

As announced in the ELECTRICAL REVIEW last week, Harrison J. Smith, general operating superintendent of the Edison Electric Illuminating Company of New York, died at his home in Washingtonville, two miles from Plainfield, N. J., June 16, from a fracture of the skull, the result of a fall. He leaves a widow, two sons and a daughter.

He was born in Hector, Schuyler County, N. Y., in 1854, and received a common school education in Elmira. During his early life, Mr. Smith worked as a carpenter in the Pullman car shops, and subsequently as a machinist on engine construction; he also fired a locomotive for a short time. In 1881, house carpenters were advertised for by the Edison Electric Illuminating Company of New York, in connection with the construction of the historic Edison station in Pearl street, and Mr. Smith, with a few others, was engaged. He continued with the company as carpenter and machinist until 1883, and after an



HARRISON J. SMITH, DIED JUNE 16, 1896.

interim of a month, entered the meter department and subsequently became its head. He left the company for about a year to engage in the wiring business, but returned in October, 1885, as electrician of the Pearl street station under Mr. Chinnock, and subsequently became superintendent of the first district. Later on he was appointed general operating superintendent of the company, which position he occupied at the time of his death.

Mr. Smith was prominently identified with the practical development of low-tension current distribution, and, in this connection, was widely known among central station men all over the country. In 1895 he was elected to a place on the executive committee of the National Electric Light Association, and was an active worker in that body. He was president of the National Electrical Exposition Company, which gave the recent electrical exposition in New York city. His efforts for the success of this project were untiring.

Funeral services were held at Mr. Smith's late residence last Thursday, and the same evening impressive Masonic services were held at the Scottish Rite Cathedral in New York. The interment was at Elmira, N. Y.

ELECTRIC LIGHT AND POWER ON A RAILWAY DOCK.

READ BEFORE THE ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS, FORTRESS MONROE, VA., JUNE 17, 1896, BY H. C. HOPE, OF ST. PAUL.

When it became necessary for the Chicago, St. Paul, Minneapolis & Omaha Railway Company to equip their new dock, 1,500 feet long, 80 feet wide, at Itasca, Wis., with fire protection, a great deal of thought and study was expended upon the subject. We consulted various authorities, and investigated different schemes suggested, and it was finally decided to build a separate building, in which would be located a triplex double-acting Gould pump, having an output of 750 gallons per minute. With this pump it is possible to obtain three effective fire streams. The maintaining of a steam-pump plant at the dock with which to furnish power to drive this pump was an objectionable feature, for obvious reasons, and it was determined to drive the pump by electric motor. The maintaining of a separate electric plant for the sole purpose of driving this motor would prove an expensive luxury, and it was decided to operate the pump from the electric light plant which it was intended to install in the shops at Itasca, distant about one mile and a half. In order to do this, an electric plant of the three-phase system was adopted, inasmuch as the same amount of power could be transmitted at the same loss, at a saving of at least 25 per cent in copper over that of any other known system.

The generating plant consists of a three-phase generator, manufactured by the General Electric Company, having an output of 75 kilowatts, or 100 horse-power, and revolves at a speed of 900 revolutions per minute. This generator is driven direct from a Ball & Wood engine of 110 horse-power. Marble switchboard panels are installed, upon which are mounted, in the lines of best engineering, all necessary instruments to give complete and handy control in the management of the apparatus. Some 400 incandescent lamps of 16 candle-power are distributed throughout the shops, round-house and depot building, which are adjacent to the generating station. These lights are installed with step-down transformers. The voltage of the generator is 2,000, and the electro-motive force of the lines to the dock is the same.

The warehouse on dock is thoroughly lighted by means of 150 16-candle-power lamps, running the entire length of same, and in two rows, and divided into sections of 300 feet, with switches located just inside of the door on their respective sides. The exterior of warehouse and dock is lighted by means of 12 arc lamps, six on each side. Extension lines are provided for both the slip and railroad side of dock, which enable the arc lamps to be carried on board ship or in cars.

The electro-motive force of motor to drive pump is 2,000 volts, and is of the induction type. The induction motor was selected for several reasons. First, it became necessary to start against a load. This could not well be obtained by using a synchronous motor. And, second, by the use of induction motors, wearing moving parts are done away with entirely. We consider these two very valuable features and well worthy of consideration.

With the above arrangement, the railroad company does away with the maintaining of a power plant at the dock, which means boilers, engines, etc., and the attendance of an engineer and assistant, and, besides, the saving in operating expenses is considerable.

ELECTRIC RAILWAY NOTES.

The Pierce-Murphy third-rail system was recently tried at Saugatuck, Ct., and pronounced a decided success.

Mayor King, of Pueblo, Colo., has vetoed the ordinance granting a franchise to the Pueblo Electric Power Company.

The Southwestern Missouri Electric Railway Company, of Carterville, has filed a statement of increase of capital stock from $500,000 to $650,000.

The petition of the Elizabeth, N. J., Street Railway Company for a franchise to change the gauge of its tracks and its motive power to electricity has been granted.

The electric street car line between New Philadelphia, Ohio, and Uhrichsville is progressing rapidly. Poles are erected half the distance, and the grading has been completed several miles. Tie and track laying will begin this week from New Philadelphia.

At the council meeting at Oshkosh, Wis., the City Attorney was directed to commence proceedings to annul the franchise of the Central Wisconsin Electric Railway Company, which three years ago obtained a franchise to put in an electric road, but only built three miles, and is now in the hands of a receiver.

A route is being surveyed from Columbus to the Ohio River for an electric railway. The success of the electric line between Columbus and Springfield, Ohio, has been so pronounced that it is likely this line to the Ohio River will be put through at once. The route followed will probably be that of the old National pike which strikes the Ohio River at Bridgeport.

The Lake Street Elevated Railway, Chicago, was opened for traffic June 14. This is the second elevated road to be operated by electricity. The electric current is carried on the side of the service track upon a third rail. The motor cars are the rebuilt cars formerly used with locomotives on the Lake street elevated. Each train consisted of three or four ordinary cars, with a motor car at the head. The motorman's cab is at the front right hand corner of each motor car.

The contract for building the Amherst & Sunderland electric railroad has been awarded to M. A. Coolidge, of Fitchburg, Mass. There were two parties whose bids were nearly for the same amount, but the directors finally decided that Mr. Coolidge should build the road. He was one of the first contractors to visit Amherst and look over the route, which he has always considered a favorable one. He shows his faith in the enterprise by taking a large block of stock. Mr. Coolidge built the road at Brattleboro, one in Gardner, and other roads in this locality. Work on the road will probably begin at once.

A new nine-mile electric road is to be built out from Philadelphia. It will be built on the Bristol turnpike. The General Electric Company will furnish the generators, motors and other electrical equipment. The engines will be of the Hamilton Corliss condensing type, made in Hamilton, Ohio. There will be four boilers, to be built by E. Keeler, of Williamsport. The rolling stock will probably be constructed at St. Louis. The company will have 15 to 20 cars to start with. They will be of the standard size, and part of the equipment will be Summer cars. J. B. Stuart, the consulting engineer of the road, has stated that it will be completed about the middle of July.

Vice-President Payne announced, a short time before his departure for St. Louis, that the Milwaukee Electric Railway and Light Company had bought the property of Pabst, or Wauwatosa, Rapid Transit Company's line, and would take complete possession of it July 1. By the consolidation of the Pabst line with the Milwaukee street railway system, the trouble of the residents west of Washington avenue, who had to pay two fares, though they were inside the city limits, will be avoided. Mr. Payne announced, also, that commutation tickets for travel between Milwaukee and Wauwatosa would be sold at seven and one-half cents. Only one offer was made by the street railway company for the Pabst line, and the terms were accepted at once. The proposition to buy was made last week. The Pabst line was built in 1892, and Captain Pabst held most of the stock.

The following is the balance sheet of the Brooklyn Rapid Transit Company (successor to the Long Island Traction Company), as of the date of May 31, 1896:

ASSETS.

Guarantee fund, for performance lease	$3,835,579
Cost 300,000 shares Long Island Traction	17,500,000
Equity in construction fund	2,647,328
Bills receivable	381,545
Interest annuities	5,722
Income interest	3,786
Individuals and companies	42,463
Cash in bank	452,198
Total	$24,915,625

LIABILITIES.

Capital stock	$20,000,000
Funded debt	4,875,000
Accrued interest on bonds	40,625
Total	$24,915,625

For the purpose of acquiring and purchasing the property, the company issued to the reorganization committee, under the terms of its mortgage, $4,875,000 worth of its bonds, the property covered by the mortgage being the capital of the Brooklyn Heights Railroad Company, of the Brooklyn, Queens County and Suburban Railroad Company, a $4,000,000 guarantee fund and other holdings.

OBITUARY.

Samuel Peck, representative of the General Electric Company in Mexico, died on June 13, while on his way to Boston to have an operation for appendicitis performed. Mr. Peck was 30 years old. He leaves a wife in Newton, Mass. He had achieved considerable success in the electrical business and was well known in the field.

STEAM BOILERS: THEIR EQUIPMENT AND MANAGEMENT.

READ BEFORE THE NATIONAL ELECTRIC LIGHT ASSOCIATION, MAY 7, 1896, BY ALBERT A. CARY.

(*Continued from page 317.*)

There are many other methods in use for purifying boiler feed-water; some are very effective while others have proved actually dangerous, owing to the faith put in them by boiler users while they are supposed to be performing their duty, whereas really they are allowing scale to form in the boilers and, owing to the security felt in their presence, the usual care of the boiler ceases until trouble forces an investigation and then trouble generally begins.

There are many "compounds" and "boiler fluids" offered to steam users which, according to the sales agents, will cure every ill the boiler is heir to. These should be accepted only after careful advice with an expert chemist or with one who is well experienced in treating feed-water, as I have known many cases where their use has been attended with serious results. It is as ridiculous to suppose that one special chemical or mixture will take care of every kind of boiler feed-water as it is to imagine that any one medicine will cure every one of our personal ills.

The matter of character of the fuel used affecting the choice of a boiler is the next subject needing our attention.

In the modern boiler plant the matter of fuel consideration becomes almost entirely one of furnace construction and management, and it has but little to do with the kind or shape of boiler used. In other words, the efficiency of the boiler is one thing while the efficiency of a furnace is another, each standing distinctly by itself. If we have two fuels which differ from each other widely, and attempt to burn them in the same furnace and with the same method of handling, we often find that our resulting economy in one case is very good while in the other it is very bad. By furnace construction I do not refer merely to the kind of grates used and their immediate surroundings, but I refer as well to the difference in the general method of setting the entire boiler to meet the fuel requirements and every change made between the grates and the flue. We have often found boilers built in certain sections of the country succeeding better by far with the fuels found in their particular section than any other boilers coming from a distance, and with what has just been said, this is most easily explained. These special boilers are built originally with the idea of handling successfully the fuel near at hand. The setting is made to suit this fuel, the inventor being perfectly familiar with the experience he and others have had in getting the best results from it. The other boiler, coming from a distance, has not had this particular kind of fuel to deal with; and therefore, until some one has become as well acquainted with the new fuel and new conditions as the inventor of the local boiler, and has been able to apply this knowledge to the setting and construction of the furnace, the local boiler is pretty sure to show much better results, notwithstanding the fact that the boiler from a distance, considered in itself, is far superior in many ways to the local one.

For many years the eastern makers of water-tube boilers have been badly handicapped in the West, owing to their lack of knowledge as to the furnace and other requirements for the successful handling of western coals, and for that reason, principally, many of the boilers built in the West, some of which are inferior to them from the points of design and construction, have succeeded in making an equal and even better record for economy. This can be traced simply to the superior methods of setting and the construction of the furnace which are thus certainly very creditable to their originators. Of late years, these eastern manufacturers have, after passing through their school of experience, studied more closely the requirements of the western fuels and have adapted their boiler setting and furnace conditions to suit the different coals found, and we are now beginning to find the eastern water-tube boilers succeeding well where they have not been highly successful before. These boilers are now being set with their tubes placed considerably higher from the grate bars, so as to provide a larger combustion chamber. We find them adopting the brick arch over their fires so as to insure the more complete combustion of the light hydrocarbon gases before they leave the furnace, and we find them introducing air, more or less heated, above the fire, which also hastens the combustion in the furnace.

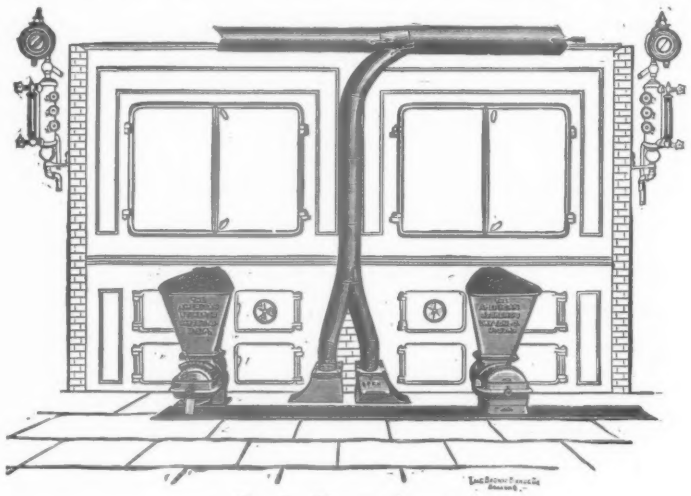


FIG. 8.—MURPHY STOKER.

Many people recognize now that furnace construction is no small factor in securing fuel economy, and this has led to almost numberless inventions of special furnaces, the best of which are now being applied to all kinds of boilers and economy of fuel and a decrease in the amount of smoke delivered from the chimney is resulting from their uses. The selection of a furnace and setting for anthracite coal is, comparatively speaking, a simple matter. The distance from the grates to the lower part of the shell or the lower tubes of the boiler does not want to be as great as when bituminous coal is used. A good chimney draught and a high furnace temperature is required to burn anthracite coal successfully. Often when ample chimney draught can not be obtained, fans, or steam jets, are used to secure the required results. When fans are made to deliver their air under the grate bars, the best results are obtained from flat-plate grate bar perforated with many conically shaped holes. A bar of this kind recently used by the author measured six inches wide by 36 inches long and one and one-quarter inch thick. It has one rib five-eighths inch thick running along the center and bottom of the plate, and was perforated with tapering (three-eighths to three-quarters inch) holes spaced about one inch from center to center. The bars are more especially designed for anthracite coal running in size from pea down to No. 2 buckwheat. By the use of this grate bar, the forced blast, instead of being concentrated on one point of the grate surface, is forced to distribute itself evenly over the entire surface, and thus preventing excessive heating at the one point and causing destruction there. Excessive clinkering often occurs with the use of this coal, the clinkers clinging tenaciously to the bars and side walls. This is sometimes remedied somewhat by occasionally throwing oyster shells into the fire with the coal, which fluxes the clinker and causes it to become more friable. Carrying water in the ash pit also helps this trouble somewhat. The highly heated ashes dropping cause a steam vapor to rise and pass through the grate bars. The steam jet is often used with this fuel to great advantage, having a good effect on the clinker and keeping the fire bed clearer and brighter. These steam jets used are, of course, made to work beneath the grate bars, and are so designed to induce and project a jet of air, and thus they displace the fan blower for forced draft.

As the furnace temperature must be high to handle this fuel well, and as the fires must be kept clear and clean at all times, it is of advantage to use shaking and dumping grates, many of which are found on the market. Great care must be taken with anthracite coal in order to get the best results as to uniformity of size of lumps. Where several sizes are mixed together, the space between any two adjoining pieces of the larger coal is filled, thus offering a very great resistance to the passage of air through the coal. The free and uninterrupted passage of air is most essential to obtain the best results. You should insist with your coal dealer to deliver you coal uniform in size, as this is very important.

There are two well known automatic stokers built in this country, made expressly to burn the small sizes of anthracite coal. These are, the Coxe stoker and the Wilkinson stoker. The former is of the endless chain pattern, receiving a continuous supply of coal on the end of the chain grate projecting outside of the furnace and then slowly carrying this coal, burning on its way, to the rear end of the furnace, by which time the combustion is completed and the ash is automatically dumped into the pit below as the chain turns over its rear roller. The other stoker referred to is the Wilkinson, which you will find on exhibition, working under the Root boilers in the Electrical Exposition, downstairs. This will be seen to consist of a series of inclined hollow grate bars. Each bar is but a few inches in width and a number of these bars are found placed alongside of each other, filling in the entire space between the side walls of the boiler. The upper part of the bars project in front of the boiler front, resting on a saddle or bearing beam. Above the bars, at this upper point, will be found a hopper, which will hold a considerable supply of coal and at the exit from this hopper will be found a revolving feed wheel, the speed of which will regulate the quantity of coal fed to the inclined bars. The lower end of these bars, at the back and near the bottom of the furnace, is found resting on another bearing beam. Into the front and upper end of each of these hollow grate bars a steam jet will be found which, when in operation, induces a supply of air. The inclined bars are constructed with a series of slight steps. In the "rise" of each of these steps is found a slot from whence the steam and air escapes to the bed of fire resting on the inclined bars. The angle of inclination of the bars is somewhat less than the angle of rest of the coal, being about 30 degrees, and a downward motion of the coal along the grates is effected by a backward and forward motion of the grate bars (the motion being parallel to the boiler-room floor), every other bar being moved in opposite directions alternately by means of a series of eccentrics placed on a shaft in front of the boiler.

With the semi-bituminous coals, carrying less than 20 per cent volatile matter, but little trouble is experienced in getting good results in the furnace. The distance between the grates and the lower tubes, or the boiler shell, should be somewhat greater than when using anthracite coal. Most of the soft-coal stokers on the market can handle this coal advantageously, and, with proper care and intelligence, it can be handled with very little smoke. Bituminous coals, carrying from 20 to 40 per cent volatile matter, require careful attention in furnace construction to obtain good results. The distance between the lower water tubes of a boiler and the grates (when hand firing is used) should be increased materially and a special furnace construction should be adopted when the best results are required. Where plain stationary grates are used, probably nothing will give better results than the fire-brick arch sprung over the grates, this arch preventing the immediate contact of the partially consumed volatile gases with the cool boiler parts, which contact results in the chilling of these gases below the temperature of ignition, thus causing them to escape with their burden of soot unconsumed. With the last two named grades of fuel there are many special furnace settings and styles of grates on the market which give splendid results and prove excellent investments. The success of these has led a large number of men (who are what we could hardly call mechanical engineers) to invent and load on the market many curiosities in the line of special furnaces and settings, and, in consequence, steam users should be very careful in their selection of these specialties, especially those which are new and untried. In the old well known automatic stokers, the character of the fuel to be used should be an important consideration in their selection, as one will handle one coal much better than another and therefore the indorsement of a steam user in one section of the country should not always be taken as a guide to aid you in the selection of a special furnace or special stoker when you will use an entirely different coal in another section.

(*To be continued.*)

ADVANCE INFORMATION

Valuable News and Tips for Manufacturers and Dealers.

We publish below information relating to new electric railways, new electric light companies, new telephone companies and projected electric construction of all kinds. Every reader will find these columns of special interest, and manufacturers and supply houses will receive many valuable suggestions looking to new business by carefully watching this department in the ELECTRICAL REVIEW.

New Electric Railways.

PORTLAND, ORE.—Crouch Motor and Traction Company has been incorporated by C. E. Leyner, M. S. Hait, Chas. R. Church. Capital stock, $100,000.

ANACOSTIA, D. C.—Capital Railway Company, which was chartered by Congress recently, has commenced surveys for the new line. Negotiations are said to be on foot with President Griswold for the use of certain portions of the route of the Anacostia & Potomac road.

WASHINGTON, D. C.—The Eckington & Soldiers' Home Railway Company has been authorized by Congress to use compressed air motors upon its system. It is also authorized to make a number of extensions into the suburbs. The company may use, if desired, underground electric conduits.

WORCESTER, MASS.—The Worcester & Marlboro Electric Street Railway Company, which was recently organized, has been granted a franchise through the towns of Shrewsbury and Northboro.

SAGINAW, MICH.—The Interurban Electric Railway Company has filed trust mortgage for $170,000 in favor of the Union Trust Company, of Detroit.

HAMPTON, VA.—The new electric road to Buckroe Beach is nearing completion and cars will shortly be put in operation.

NEWPORT, KY.—The Cincinnati, Newport & Covington Street Railway Company will construct an electric railway at a cost of $1,000,000.

BRADDOCK, PA.—The Pittsburgh, Braddock & McKeesport Traction Company has been granted the right of way for its proposed electric road.

WORCESTER, MASS.—A company has been organized to build an electric railway from Worcester to Clinton and Fitchburg. Capital stock, $150,000.

CAPE MAY, N. J.—The Cape May Transportation Company has been incorporated by J. H. Edmunds, John W. Thompson and Thomas S. Stevens to lease and operate the electric railways of Cape May. The following officers have been elected: J. H. Edmonds, president and treasurer; Thomas S. Stevens, secretary.

LANCASTER, MASS.—A bill has been introduced in the Massachusetts House for the purpose of incorporating the Lancaster "L" Railroad. Capital stock, $1,000,000. Incorporators are W. W. Kimball, J. F. Lancaster, J. F. Merrill, James Armstrong, B. F. Reach and J. R. Graham.

OAKLAND, CAL.—The Laundry Farm Railroad has begun operations as an electric line.

LONG ISLAND CITY, L. I.—At a meeting of the Queens County Board of Supervisors in Long Island City, last week, a franchise was granted to the Long Island Electric Railroad Company to run a trolley line between Jamaica and Queens, a distance of three miles.

TAUNTON, MASS.—It is said that the Brockton, Bridgewater & Taunton electric railway line will be begun next month.

FITCHBURG, MASS.—M. A. Coolidge of this city will probably secure the contract to build the electric railway connecting Amherst and Sunderland. The power house may be located at North Amherst, where desirable places can be obtained.

ELIZABETH, N. J.—The City Council has granted a new franchise to the Elizabeth Street Railway Company to change the gauge of its tracks so as to equip the road with electricity.

AMHERST, MASS.—The contract for building the Amherst & Sunderland Electric Railroad has been awarded to M. A. Coolidge, of Fitchburg.

Electric Light and Power.

UNION, S. C.—The Mayor may be addressed for information concerning the issuance of $40,000 in bonds for waterworks and electric lights.

EAGLE GROVE, IOWA—The electric light plant will be greatly enlarged.

LOS ANGELES, CAL.—West Side Lighting Company has been incorporated by E. E. Peck, E. F. Billmeyer, Los Angeles; George H. Barker, William R. Slaats, Walter S. Wright, Pasadena. Formed to generate electricity to furnish heat, power and light. Capital stock, $500,000.

NEW YORK, N. Y.—Acme Electric Lamp Company has been incorporated by L. A. Jackson, of New York city; G. D. Phillips, Jared F. Harrison, of New Rochelle; Elbert C. Rosevelt, of Pelham Manor, and C. M. Cumming, of Yonkers. Capital stock, $50,000.

SOUTH HAVEN, MICH.—Steps are being taken to establish an electric fire alarm.

HAWKINSVILLE, GA.—Bonds will probably be issued for the erection of an electric light plant.

CAMERON, MO.—Geo. P. Long, Mayor, can give information concerning establishment of $8,000 electric light plant.

NEW ORLEANS, LA.—The Drueding Gas Light Company has been incorporated by L. H. Drueding, Jules Buchel, and Frank McGloin, to make and sell gas lighters, etc. Capital stock, $5,000.

CHICAGO, ILL.—The Western Light and Power Company, Max Eichbergn, president, will erect a $35,000 electric power house in the rear of 619 to 631 Seminary avenue.

MORRISVILLE, PA.—Delaware River Power Company has been incorporated by Anthony M. Jane, Geo. Pfeiffer, Jr., Chas. Y. Audenreied, Rudolph V. Kuser.

CAMDEN, N. J.—Canadian Sterling Light Company has been incorporated by Arthur D. Hanson, John J. Ranagan, New York, N. Y., Clifford W. Perkins, East Orange, N. J. Capital stock, $100,000.

BUCYRUS, OHIO—A $12,000 power and electric plant will be constructed for the Crawford County commissioners, and D. L. Stine, architect, Valentine Building, Toledo, Ohio, has prepared plans for same.

CHESTER, MASS.—An electric light plant will probably be constructed at a cost of $8,000.

BURLINGTON, IOWA—E. E. Follensbee has transferred the electric light plant to C. S. Cross, of Emporia, for $2,750.

BRIDGTON, ME.—A committee has been appointed to make a contract for a system of arc lighting.

LEBANON, OHIO—The Secretary of State to-day granted articles of incorporation to the Lebanon Light and Magnetic Water Company, of Lebanon; capital $20,000. Incorporators, W. H. Owens, Isaac Kaskinson and J. P. Nixon.

LAFAYETTE, COLO.—E. W. Cannon broke ground here to-day for the erection of an electric light plant.

PAWTUCKET, R. I.—This city is to have a municipal electric lighting plant.

AMERICUS, GA.—A committee has been appointed to ascertain the cost of building an electric light plant.

HAGERSTOWN, MD.—The Hagerstown Electric Railway Company will increase the capacity of its electrical system for the purpose of supplying power to navigate boats on the Chesapeake and Ohio Canal and pleasure craft on the Potomac River.

LAKEWOOD, OHIO—This city will shortly have an electric light plant.

New Manufacturing Companies.

BANGOR, ME.—Seymones & Poor Carbonate Company organized at Kittery for the purpose of making, selling and leasing Rhinehart's instantaneous carbonate and the right to use the same. President, Wm. D. Lewis, of Boston, Mass.; treasurer, Benj. D. Poor, of Boston, Mass.

CLINTON, WIS.—The Standard Incandescent Lamp Company has been incorporated by Frank B. Thompson, Charles G. Frapp and A. F. Opperman. Capital stock, $10,000.

CAMDEN, N. J.—Pan-American Sterling Light Company has been incorporated by John S. Parker and John J. Ranagan, of New York, and Clifford W. Perkins, of Orange, N. J., to manufacture lights and lamps for gas, etc. Capital stock, $100,000.

ATLANTIC HIGHLANDS, N. J.—E. B. Cutter Electrical and Manufacturing Company has been incorporated by Ira Antonides, Wm. H. Porter, Jr., Rutsen S. Snyder, of Atlantic Highlands; Amzi M. Porter, of Navesink, N. J., and E. B. Cutter, of New York, N. Y. Capital stock, $30,000.

SYRACUSE, N. Y.—The Syracuse Electric Manufacturing Company has been incorporated. They will sell electrical and mechanical appliances, apparatus and specialties; capital stock, $20,000. Directors, Hugh J. Brady, of Cooperstown; John Begley, of Gloversville; Robert E. Drake, Morgan A. Dunn and Clinton S. Carr, of Syracuse.

New Telephone and Telegraph Companies.

MACON, GA.—The Macon Telephone Company has been incorporated by Simon Baer, of Atlanta, Ga., J. M. Blakeley and others. Capital stock, $100,000.

PORTERVILLE, CAL.—Mount Whitney Telephone and Power Company has been incorporated by J. M. Gilstrap, of Daunt, Cal., and James Mursell, W. E. Sprott, A. M. Lumley, H. L. Brey, of Porterville, Cal., to construct and operate power plants and telephone lines. Capital stock, $2,000.

HAGERSTOWN, MD.—The Western Union Telegraph Company will shortly replace all the iron wires between Washington and Cumberland with copper wires.

Increase of Capital.

ST. LOUIS, MO.—The Southwest Missouri Electric Railway Company, of Carterville, filed a statement of increase of capital stock from $500,000 to $650,000.

Electrical Development.

In a recent article the New York *Times* gives the following figures relating to electrical development:

The capital invested in electric lighting is put at $325,000,000; invested in private plants, $200,000,000; number of arc lights in use, 250,000; capital invested in electric mining machinery, $100,000,000; invested in 500,000 stationary electric motors, $60,000,000. Concerns that use from 50 to 100 motors each are very numerous. It is estimated that more than 90 per cent of all the street and suburban roads are operated by electricity; number of trolley cars, 25,000; total miles, 12,000; combined capital of electrical railways, $700,000,000. Total investment in electrical industry is placed at $1,410,000,000, covering a period of 15 years. Number of men estimated to be employed in electrical industries, 2,500,000.

McClure's Magazine for July will have an illustrated paper by Cleveland Moffett, showing the exact status, at the present moment, of the horseless carriage, and indicating the immense revolution that impends in travel and traffic, now that the horseless carriage has practically passed the experimental stage.

REDUCTION OF RELAY RESISTANCE.

READ BEFORE THE ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS, FORTRESS MONROE, VA., JUNE 17, 1896, BY U. J. FRY, OF MILWAUKEE.

During the last decade the wonderful electrical developments have so engaged the attention of all to such an extent that improvements in the telegraph machinery have been quite forgotten, or it has been thought that there was no necessity for further development or improvement. While this may be the case, to a greater or less degree, with those having charge of the operation, the construction department has been busy bettering the condition of its lines, and has accomplished a great deal, but other conditions are not just what they should be.

There has been much change in instruments, especially in the relays.

The first relay the writer ever used was a 150-ohm instrument. Later, when engaged on another road, the resistance was found to be 225, 350, 400 and 500 ohms; 400, I believe, was considered the standard, and thought to be about the proper thing. The superintendent of the latter road referred to has recently made a radical change in the standard of his instruments. I presume you will hear from him on the subject later.

Just before the writer came to the road on which he is now engaged, the standard for relays was changed to 150 ohms. Prior to that, relays of different resistance, from 100 to 350 ohms, were found on the same circuits; but when relays of uniform resistance were placed, a decided improvement was noted, and everything seemed to have reached a satisfactory state. During foggy and rainy weather, however, this condition of affairs is unsatisfactory. The numerous requests from train dispatchers and division superintendents for wires which will work during stormy weather, and the fact that any delay to a train is a serious matter, a circuit which will work through any kind of weather has become an imperative necessity.

With a view of improving the condition of the wires, the writer gave the subject considerable attention, looked over the lines carefully, and finding the insulation good, came to the conclusion that something else must be done.

Realizing the detrimental effect of large batteries, it occurred to the writer that, if we could reduce them, we would remove part of the difficulty. In order to do this it would be necessary, of course to reduce the resistance of our circuits, and we concluded that the only thing we could do in this line, under the circumstances, would be to change our present relays from series to multiple, thus giving us 37½ ohms' resistance, instead of 150. Having decided upon this plan, and remembering that we had read and often heard it said that the resistance of the instruments should not exceed that of the circuit, we selected a wire on which we could secure this condition after having changed them. The circuit chosen was a Milwaukee to Oshkosh No. 8 gauge wire, 104 miles in length, measuring about 15 ohms per mile, or 1.500 ohms, with 35 relays in circuit; relay resistance, 5,270; total, 6,810. After replacing the old with the low-resistance relays, we found the total resistance to be 2,872, a difference of 3,938, or the amount of relay resistance taken out. We then reduced our batteries from 150 to 75 cells. After working this wire for six months in this way, we noted the following comparisons: Prior to the change, the wire did not work in the best of weather satisfactorily, and in foggy and rainy weather very unsatisfactorily, and at times we were unable to work more than half way. The current in bad weather fluctuated so that it was impossible for the operators to keep their instruments adjusted. After the change the wire worked perfectly in any kind of weather.

This perfect condition has not been secured on all our circuits, because the conditions are not exactly the same. We have seven circuits arranged in this manner. We are doing business right along irrespective of the condition of the weather. One of our circuits, 200 miles in length, equipped with this class of instruments, did not at first give us the desired results, and we were considerably annoyed in bad weather. We placed a 50-cell battery in the middle of this wire, which resulted in a decided improvement. While this circuit may not work quite as well as shorter ones arranged in this manner, it has improved it wonderfully; so much so, that our dispatchers are able to handle trains in all kinds of weather, without delay.

Prior to the change, our Chicago to Savannah dispatchers' wire, 138 miles in length, worked so badly in rainy weather, that at times we were unable to work with Elgin, a station 35 miles out of Chicago. This circuit was a new No. 8 gauge iron wire, new line of poles, insulation as perfect as glass could make it. After we changed to the lower resistance instruments, our dispatchers were able to work the wire its entire length with about the same degree of rapidity in rainy weather as in dry weather. Without having tried, it is our opinion, however, that if we should equip this circuit with 25-ohm relays, and place a battery of, say, 30 to 50 cells in the middle, we would secure still better results.

We have been experimenting with a 25-ohm relay on one 200-mile circuit, and are meeting with exceptionally good results. We find that during a thunder and lightning storm, this relay performs much better than the 150-ohm relay. When it is affected by lightning, it discharges so quickly that it obliterates only a letter or two, instead of a word or two, as is the case with the old instruments. We expect to equip the entire circuit with 25-ohm relays in the near future. We do not wish to be understood as claiming that 25 ohms is the proper resistance; but we have met with such encouraging results, that we are going to give them a trial.

Now, Mr. President, do the railway telegraph superintendents realize their relations to the telegraph fully? After having constructed a line, the telegraph company turns it over to the railway superintendent, and expects him to keep it in repair. On the other hand, the railway company expects him to do the same. Whenever there are any interruptions of a serious nature, the railway superintendent is expected to look after and remove the trouble.

When we look the matter fully in the face, we can not but think that all look to the railway superintendent for a good condition of the telegraph. In view of our relation to the system, does it not occur to you that the railway superintendents should have a voice in the matter of equipping the circuits upon their respective roads, more especially those set aside for the exclusive use of the railway company? If it appears they should, we would ask the members present, Are you satisfied with the working condition of your lines? Do your wires work well in all kinds of weather? If not, do you not think that, if a better condition could be secured, we owe it to the companies by which we are employed to secure, in some manner, that which will put them in a better condition, or in a condition to work at any and all times? Do we realize fully what the delay to traffic costs the railway company?

Would it not be pleasant if we could realize that our telegraph system was in a condition to work well at all times? Can such a condition be secured? If so, how, and by whom?

Are there any more interested in this matter than we? Will the members of the association start the inauguration of a new era for the telegraph?

A Pair of Large Turbines.

The Dayton Globe Iron Works Company, successors to Stout, Mills & Temple, of Dayton, Ohio, are shipping to the Boston & Montana Consolidated Copper and Silver Mining Company, Great Falls, Montana, the largest and most powerful pair of horizontal turbines, under the head they will operate, that have ever been turned out by any turbine builders in this country. These turbines are of the latest design, 57 inches diameter, and under the average head they will work will develop 3,258 horse-power.

The turbines are placed on a cast-iron draft chest and discharged centrally through a draft tube, and are surrounded by an iron flume 14 feet six inches diameter, 32 feet six inches long, the whole mounted on double I beams on each side, 20 inches deep, 38 feet long, with four cross I beams.

The shaft is finished, 10 inches diameter, 42 feet six inches long, made of the best hammered iron. The weight of the shaft alone is over five tons, is made in two sections. The coupling, which couples the sections together, weighs over one ton.

There are stands outside of the flume at each end which support the shaft. Each of these stands weighs 8,000 pounds, on which is placed babbitt-lined journal boxes, in which the shaft revolves.

The two turbines and outfits, complete, weigh 250,000 pounds or 125 tons, and require seven cars of nearly 20 tons each to transport same.

These turbines are to operate two electric generators, one coupled directly to each end of the shaft, which will run 144 to 160 revolutions per minute, and will be used for smelting. The varying revolutions are required in order to increase or diminish the blast as conditions may require.

The whole outfit is made of the best material and workmanship, and certainly does great credit to the engineering skill of the Dayton Globe Iron Works Company, and shows their ability to turn out this class of machinery on a mammoth scale.

W. M. Mills, vice-president and general manager of the Globe Iron Works, the veteran turbine builder, says if a pair of 57-inch turbines of this design and capacity were put in operation on the new water-power at Niagara Falls, under 140 feet head, they would develop 18,494 horse-power and would require a hammered iron shaft 15 inches diameter to safely transmit the power, estimating the power to be taken off at each end of the shaft, as it will be at Great Falls.

TELEPHONE NEWS AND COMMENT.

Franklin, Mass., is to have a new telephone exchange or know the reason why.

Toledo, Ohio, is agitating the question of putting its electric wires underground. City Electrician Greene has drafted an ordinance and the city council is debating it.

For a fee of from two to eight cents a message, one may talk from even the smallest of Swiss towns over a long-distance telephone system to any part of the country. The instruments are kept in perfect repair and the service is said to be excellent.

President J. E. Keelyn, of the Western Telephone Construction Company, Chicago, has written to Senator Cullom protesting against the granting of the Drawbaugh patents. He asserts that these patents are owned by a syndicate, which will endeavor to sell them to the Bell company. Mr. Keelyn further states that the government suit against the Bell company on the Berliner transmitter patent will be heard by the Supreme Court on October 19.

Major McKinley heard the last day's proceedings of the Republican Convention over the long-distance telephone at his home in Canton, Ohio. Murat Halstead thus describes the balloting scene for the *Journal:*

Major McKinley stepped to the telephone and listened to the roar of the convention at St. Louis. He heard it distinctly, and following his example, I could make out a vast roar struck through with shrill notes, and it was like a storm at sea, with shrill shrieks of wind.

The annual meeting of the stockholders of the Cleveland Telephone Company was held in Cleveland, June 13, and the following directors elected: Wm. Edwards, A. B. Hough, W. J. McKinnie, George W. Short, J. P. McKinstry, E. P. Williams, of Cleveland; Charles E. Adams, Levi Sprague, Charles J. Glidden, of Lowell; John E. Hudson and Thomas Sherwin, of Boston. The directors organized by the election of Levi Sprague, president; Charles J. Glidden, vice-president and treasurer; Charles A. Grant, assistant treasurer; James P. McKinstry, general manager; George B. Perham, secretary.

M. J. Carney, general superintendent, and L. G. Richardson, general solicitor, of the Central Union Telephone Company, were in Des Moines last week. The franchise of the company expires next month, and the prospective passage of a regulating ordinance by the city council is supposed to be the cause of the visit. The company will try to secure an ordinance to its liking; failing in which, it is said that it will resist any attempt at regulation, on the ground that the State law gives to telegraph and telephone companies the right to erect and maintain poles and wires along the public highways of the State.

THE OLDEST ELECTRICAL WEEKLY IN THE UNITED STATES.

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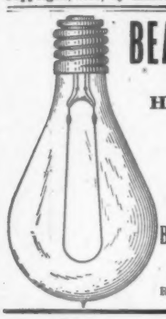

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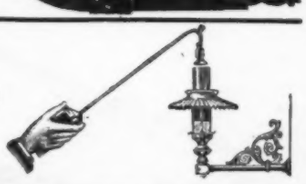

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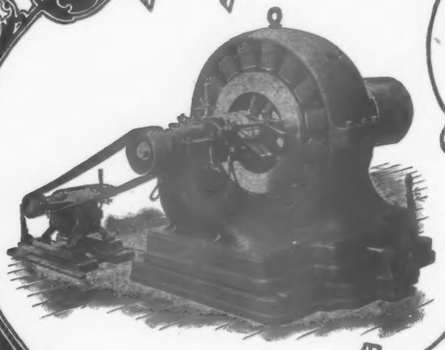

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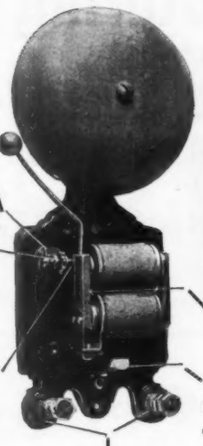
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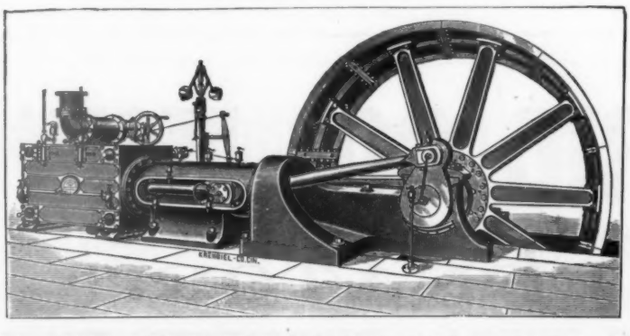

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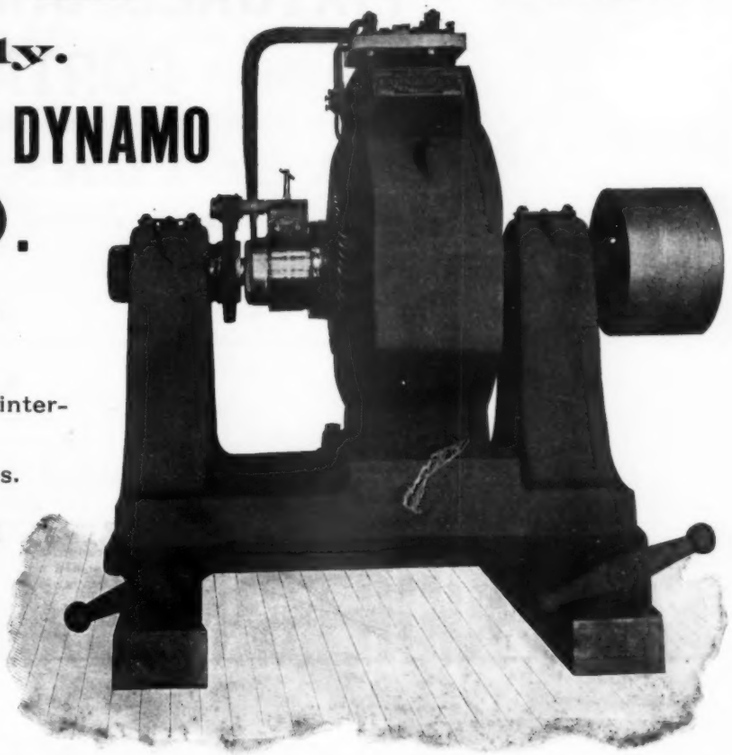

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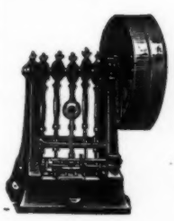

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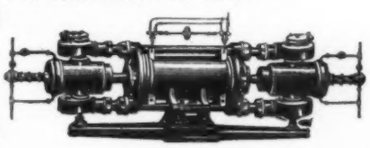

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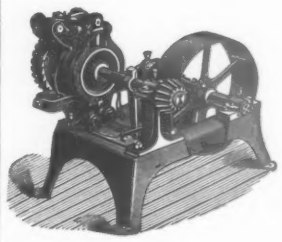

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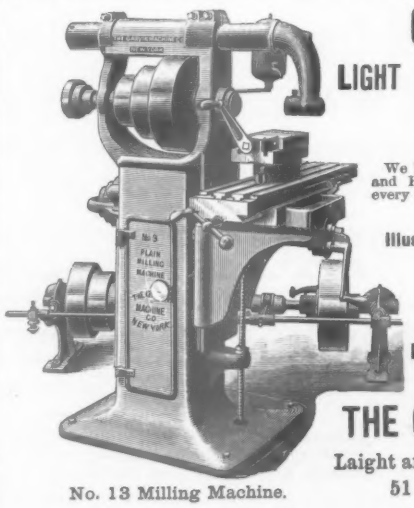

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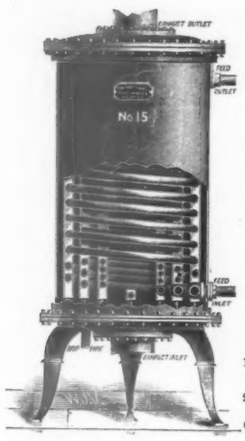

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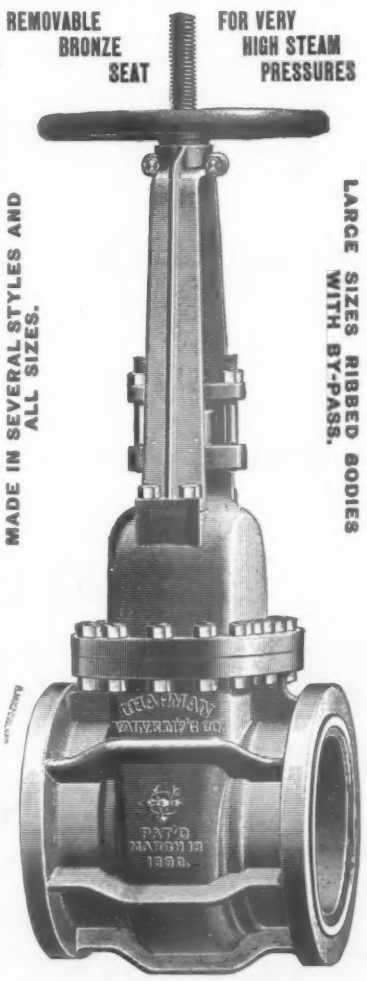

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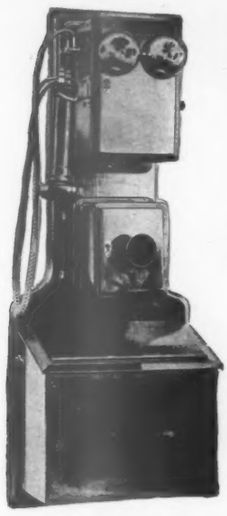

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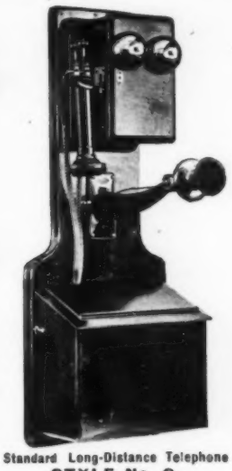

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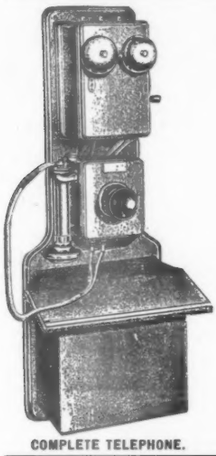

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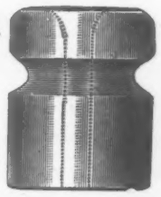

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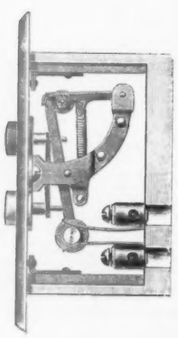

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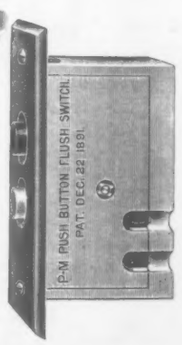

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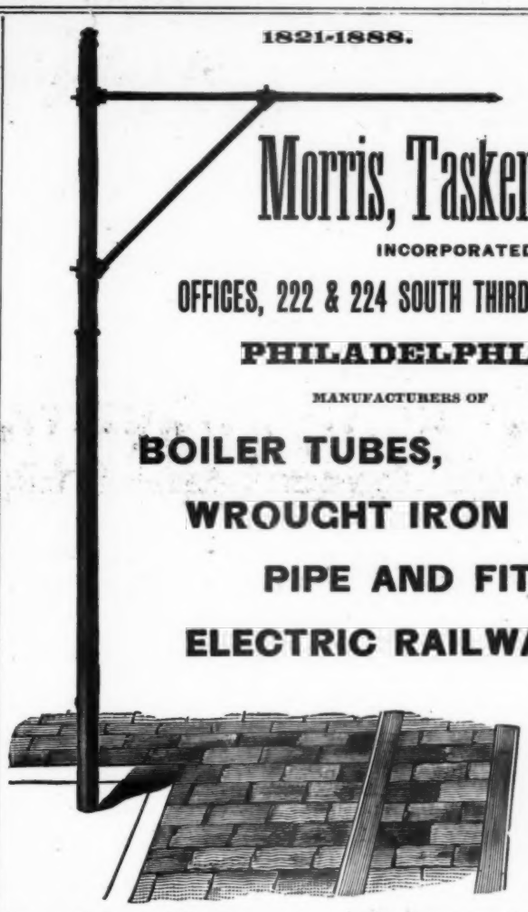

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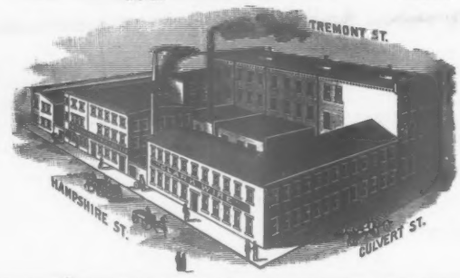

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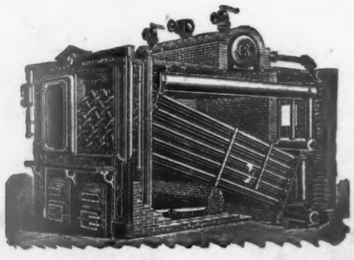

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